Engineering Library

Founded 1874—Fifty-Two Years of Service

Electrical World

McGraw-Hill Publishing Company, Inc. *November 27, 1926* Price Twenty-five Cents Per Copy

Noark Service Boxes

For Severe Service in Exposed Locations

COMBINED FUSE BOX AND EMERGENCY SWITCH

For use by central stations and industrial plants in places where rugged strength and positive protection against dampness and moisture are essential.

Designed so that the fuses may, if desired, be pulled upon opening the box.

Made in 2, 3, 4 and 5 pole types for potentials up to 600 volts.

Fittings for lead covered cable, iron conduit, BX or open wiring.

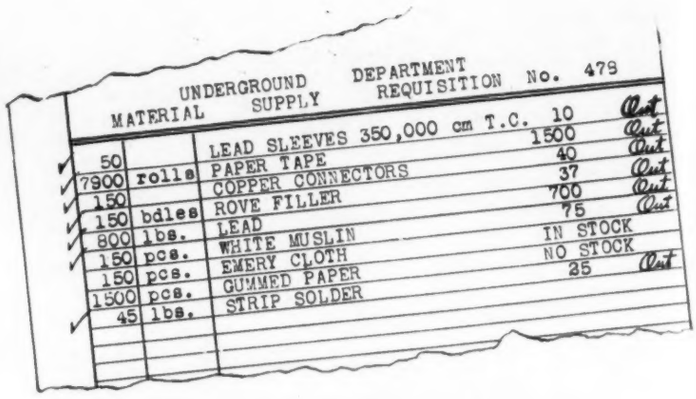
Ask for Catalog No. 55.

With handle vertical opening the cover Does not pull the fuses.

With handle horizontal opening the cover pulls the fuses.

The Johns-Pratt Company
Division of Colt's Patent Fire Arms Mfg. Co.
New York Boston Hartford, Conn. Chicago San Francisco

Never Out of Stock


UNDERGROUND SUPPLY DEPARTMENT
MATERIAL REQUISITION No. 478
50 LEAD SLEEVES 350,000 cm T.C. 10 Out
7900 rolls PAPER TAPE 1500 Out
150 COPPER CONNECTORS 40 Out
150 bdles ROVE FILLER 37 Out
800 lbs. LEAD 700 Out
150 pcs. WHITE MUSLIN 75 Out
150 pcs. EMERY CLOTH IN STOCK
1500 pcs. GUMMED PAPER NO STOCK
45 lbs. STRIP SOLDER 25 Out

A METROPOLITAN Cable Joint Comes to You Complete

It cannot get out of stock because it is supplied in two cartons ready for the splicer and including everything that goes to make up the joint.

The Big Difference

between this and other joints is the Electrostatic Shield (a Murray patent) supplied only with the Metropolitan joint. This shield distributes equally the electrical stresses around the conductors.

In the Laboratory

this joint withstood abnormal stresses of 210,000 volts—and a continuous strain for eight hours of 160,000 volts.

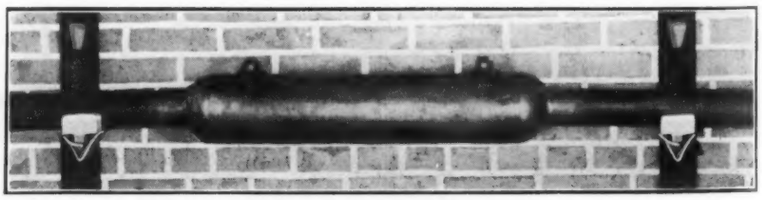
Metrolatum is a petrol compound, especially made and insures perfect uniformity of saturation between joint, sleeve and cable ends.

In Service

Thousands of these joints in service for 10 years on line potentials up to 26,400 volts.

All Ready

Entire material for making a Metropolitan Metrolatum filled cable joint is packed in two cartons ready for the splicer, on the job. Use the coupon for complete details.



Metropolitan Device Corporation

1250 Atlantic Avenue BROOKLYN, NEW YORK

METROPOLITAN DEVICE CORPORATION,
1250 Atlantic Avenue, Brooklyn, N. Y.

Gentlemen: Please send me 16-page booklet describing High-Tension Cable Joints.

Name ..... Company .....

Address ..... Title .....

Vol. 88, No. 22 New York, November 27, 1926 *Pages 1103-1152*

L. W. W. MORROW
Managing Editor
EARL E. WHITEHORNE
Commercial Editor
ALLEN M. PERRY
Associate Editor
G. F. WITTIG
Statistical Editor
H. M. CAMERON
Financial Editor
F. C. WELLS
News Editor
EUSTACE C. SOARES
Manufacturing and Markets Editor
L. H. CHURCH
Assistant Editor

Electrical World

The Consolidation of Electrical World, Electrical Engineer and American Electrician

W. H. ONKEN, JR., *Editor*

FRANK R. INNES
Western Editor
7 South Dearborn St., Chicago
H. S. KNOWLTON
New England Editor
88 Tremont St., Boston
WALTER C. HESTON
Pacific Coast Editor
883 Mission St., San Francisco
T. P. KINDIG
Assistant Editor
401 Guardian Bldg., Cleveland
PAUL WOOTON
Washington Correspondent
Colorado Bldg., Washington
B. L. SHEPHERD
Southern Editor
Alabama Power Co. Bldg., Birmingham

Contents of This Issue

Editorials 1103

Frontispiece—Electric Car Dumper at Great Lakes Port 1106

Speeding Traffic with Light Signals 1107

BY CARL E. EGELER

Characteristics which are desirable in different-purpose signals, optical means for providing effective distribution of light and methods of furnishing flexible control for speeding up traffic on main thoroughfares are discussed by the author.

Economic Benefits of the Electric Range Load 1111

In this article the problems of electric range economics are attacked in an unusually clear-cut and comprehensive manner and should be highly instructive to executives and sales managers in both manufacturing and utility circles.

27,000-Hp. Hydro-Electric Development at Gulf Island, Me. 1114

Factors in Overhead Line Clearance 1115

BY W. C. WAGNER

Results of a comprehensive study of sag-span relations in the design of aerial lines and the fallacy of assuming that the change in sag increases indefinitely with the increase in span is demonstrated.

High-Voltage Field Testing of Cables ... 1117

BY C. L. KASSON

Development of field equipment, features of the portable kenotron set which is 2 tons lighter than the usual portable equipment and the value and need of careful field tests are discussed.

Wood as a Fuel for Generating Electric Power 1121

Letters from Our Readers 1121

Central Station and Industrial Practice . 1122

Estimated Cost of 10,000-Hp. Hydro Development 1122
Rubber-Insulated Cable Under 840 Ft. of Water 1122
Constant Electric Heat for Refining Honey 1123
Increase Rating 13½ per Cent with Static Condensers 1124
Meter-Testing Jack 1124
Switchboard Wiring at Mitchell Dam 1125

Commercial Activities and Public Relations 1126

Points Way to Greater Domestic Loads 1126
Tying Utility Service with Civic Advantages ... 1127
Double-Throw Switch Not Warranted for Water Heater 1127
Electric Boiler for Bakeries and Pressing 1127
Utility Sells Refrigerators 1128
Introducing the "Trouble Shooter" to Public ... 1128
New Lighting of Boise Station and Railroad Yard 1128

Digest of Electrical Literature 1129

News of the Industry 1131

Men of the Industry 1139

Court Decisions, Commission Rulings ... 1140

Financial and Corporate 1141

Manufacturing and Markets 1145

Activities of the Trade 1148

New Equipment Available 1149

Construction News 1150

Electrical Patents 1152

McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., NEW YORK, N. Y.

JAMES H. McGRAW, President
JAMES H. McGRAW, Jr., Vice-Pres. and Treas.
MALCOLM MUIR, Vice-President
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
C. H. THOMPSON, Secretary

WASHINGTON, Colorado Building
CHICAGO, 7 South Dearborn St.
PHILADELPHIA, 1600 Arch St.
CLEVELAND, Guardian Building
ST. LOUIS, Star Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie Street, London E. C. 4

Cable Address "Machinist, N. Y."

Publishers of

Engineering News-Record — American Machinist
Power — Chemical and Metallurgical Engineering
Coal Age — Engineering and Mining Journal
Ingeniería Internacional — Successful Methods
Bus Transportation — Electric Railway Journal
Electrical World — Electrical Merchandising
Industrial Engineer — Radio Retailing
Journal of Electricity
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.
Circulation of this issue, 19,550

The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra foreign postage, $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.

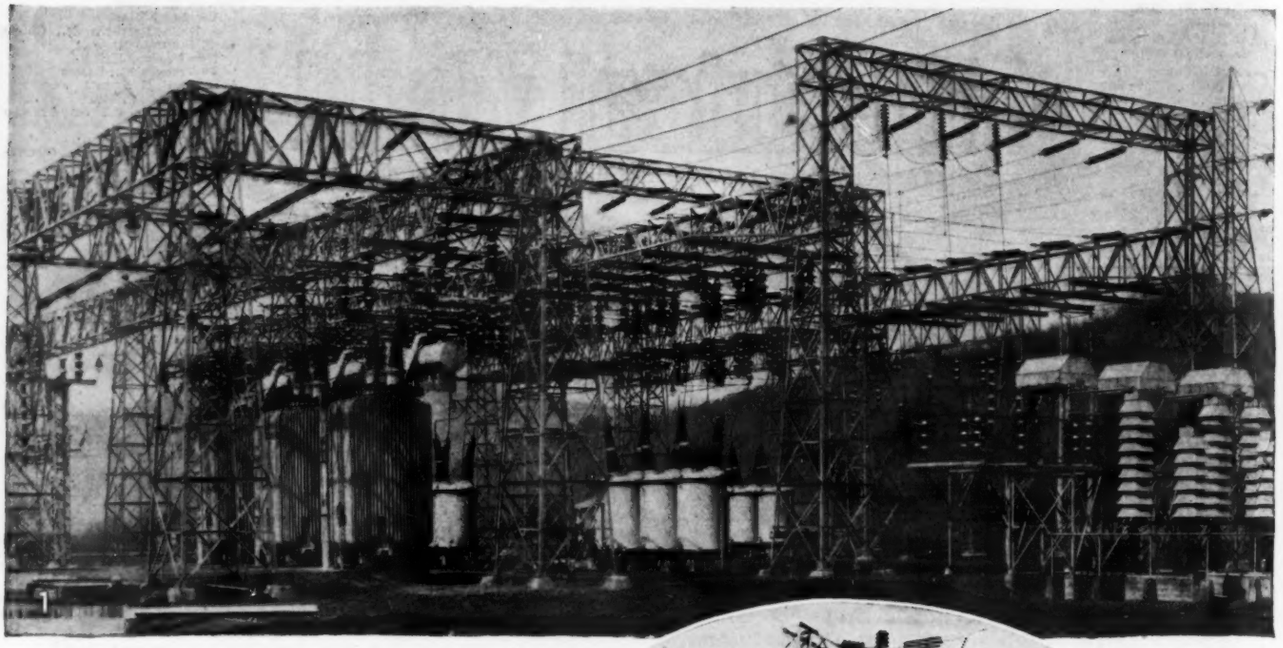
Change of Address—When change of address is ordered the new and the old address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1926, by McGraw-Hill Publishing Company, Inc.

Published weekly

Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.

Advertising Index—Alphabetical, 94; Classified, 88, 90, 92; Directory of Engineers, 38, 39; Searchlight Section, 40-46



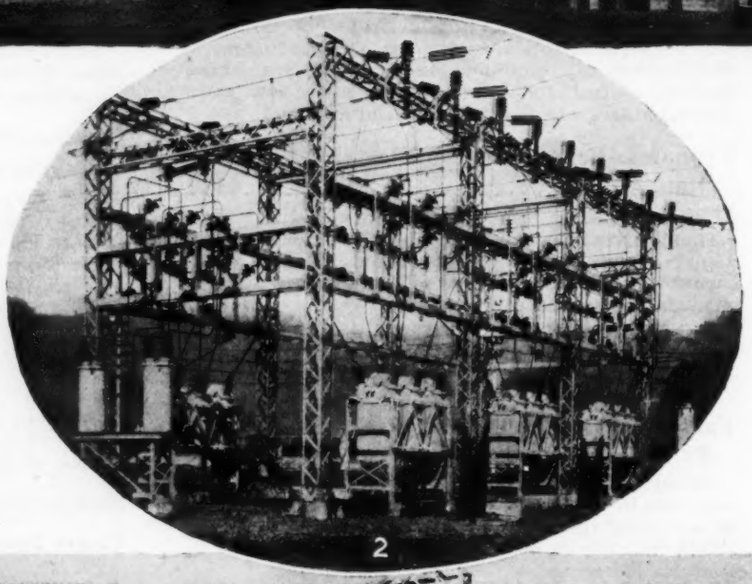
These pictures appeared on page 516, Sept. 11 issue of Electrical World

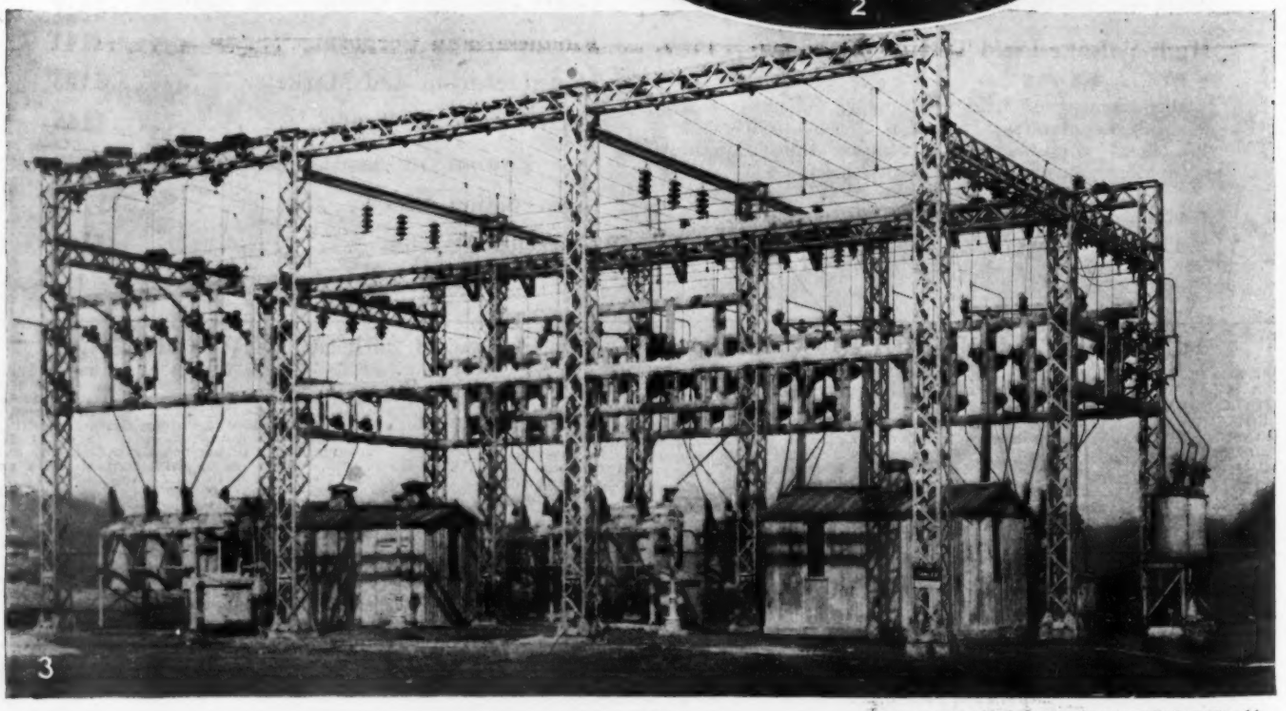
THE DISCONNECT SWITCHES ARE OF THE UNIT TYPE FORM BUILT BY

DELTA STAR ELECTRIC CO. CHICAGO

Have you noticed that most of the Super-power Substations use Unit Type?

(You can't ignore facts like these)





See Page 516, Electrical World, Sept. 11

Electrical World

Published by McGraw-Hill Publishing Company, Inc.
W. H. ONKEN, JR.
Editor

VOLUME 88 — New York, Saturday, November 27, 1926 — NUMBER 22

A Master Operator Points the Way

SPEAKING to the Electric Association of Chicago on the electrical developments in the Chicago district, Samuel Insull gave a masterly portrayal of the opportunities which lie before the industry. Naturally what he said was of most concern to his own companies, which operate in that district; but, reading between the lines, the address had a wider significance and was a challenge to the entire industry. Hereafter no unit smaller than 50,000 kw. will be installed in Chicago, nor will any machine of less rating be installed in the outlying stations at Waukegan, Joliet and Michigan City; at Dresser, near Terre Haute, or in a station to be built at Pekin, Ill. Such a superpower program, while it is a logical outcome and indicative of the faith and daring of the Insulls in things electrical, will elevate the Chicago district industrially to a plane higher than most industrial centers of the world and exceeded by none.

It is to Mr. Insull's remarks with reference to the commercial phases of the business, however, that attention should be especially directed, because, although large cities naturally possess large generating stations which no small city can emulate, the use of electricity need not be restricted even in a hamlet. The per capita consumption of electrical energy in Chicago is large because the service and its low cost merit it. With greater standardization of wiring material and supplies and cheaper wiring, Mr. Insull looks for greater consumption and saturation with their attendant economies. It is this outlook, this glimpse into a future full of promise for the industry, given by an operator of long experience and acknowledged skill, that is so encouraging and that should give heart and purpose to any wavering ranks in the industry that still fear to launch out on the sea of greater business and electrical development.

Can Railroad Electrification Be Expedited?

REALIZING that the greatest deterrent to the electrification of steam railroads is cost, one electric utility company, instead of merely planning to sell to the railroad high-voltage energy which would have to be transformed and possibly converted and fed to the electric locomotives or motorized cars, is considering the advisability of providing all the equipment for motive power up to the contact shoe. This has been done in part by the Commonwealth Edison Company, which in supplying energy to the Illinois Central Railroad for its terminal electrification has provided the stepdown and converting substations along the right-of-way.

The plan would include provision of the contact system. The legal phases of providing equipment on the railroad right-of-way have not been worked out, but the situation appears to parallel the conditions brought about by running transmission lines over other persons' property with only pole rights or easements and by providing substation equipment on customers' property. How well the railroads to be approached will take to the proposed plan is also still uncertain.

Another suggested means of meeting the obstacle to electrification raised by the great investment it involves is that the manufacturer of the electric locomotives or electrified cars might supply them on a rental basis, covering maintenance with an additional charge which would gradually wipe out the principal. Or some other plan of this nature could be worked out by the manufacturer in conference with the railroads. The attraction of such proposals lies in the promise they hold out that utility companies and manufacturers may promote electrification on a definite basis which the railroads can interpret in terms to which they are accustomed.

The New England Conference Scores Again

TWELVE hundred representatives of the ablest business leadership of the Northeast met last week at Hartford in the second New England Conference, and if any one left this notable gathering without renewed optimism and courage, he must indeed have been out of tune with the proceedings. The conclusion was inescapable that a new spirit of co-operation and will to work for New England's upbuilding is leavening the old-time conservatism of this section. Individualism has always been prized in this corner of the country, but liberty in economic development is consistent with team play for the common good. It is a fine thing to see men of neighboring states meeting in such numbers to solve their particular problems, and New England is to be congratulated upon making so much progress in a single year.

The leading utility companies have shared these councils from their inception. Electric power has been among the foremost matters discussed, and the importance of electricity in New England development is generally recognized. As anticipated, the power session at Hartford aroused great interest. The offer of leading companies voluntarily to submit interstate power contracts to regulation by joint state commissions was received with appreciation. Federal control found no advocates among delegates from either town or country. The problem of rural electric service financing came to the front in the discussion from the floor, and will undoubtedly receive the earnest study of the New England Council during the coming year. The power companies stand ready to help the council at all times, and the opportunities to make real headway against the economic difficulties involved is full of promise. It is grati-

fying to see that every one concerned in this broad movement for New England improvement and development is seeking simple solutions for problems, as in the proposed contract clause providing for joint commission regulation. Complicated plans are being set aside in favor of methods upon which agreement is easier as matters of broad principle. In the words of Owen D. Young, New England's coat and collar are off, and through the elimination of unnecessary barriers between states and by hard work, what may not be achieved?

Electric Heating Serves the Steel and Automobile Industries

AUTOMOBILE manufacturers are becoming more and more stringent in their requirements for the steel they buy. Higher quality and greater uniformity in the sheet steel and steel parts which are used in large quantities are being demanded so that automobiles can be built better and cheaper. This condition is felt through the steel industry in the pressure for higher quality. It is reported that one large maker of automobile parts recently had 60 per cent of his product rejected one week by an automobile manufacturer largely because the parts were not of a uniform hardness. Needless to say, the heating process used in treating this steel was not electric.

In another case a large manufacturer of steel sheets used for fenders had difficulty in satisfying the requirements of the automobile manufacturer because the sheets were not uniformly annealed and would split when being formed in a press. The sheet maker found the answer in the installation of an electrically heated continuous annealing furnace which not only turned out sheet steel of the desired uniformity but did it twice as fast at an over-all saving of 15 per cent in the cost of annealing. Thus the value of electric heat applied industrially was again demonstrated.

It has been predicted that within the next five years all of the steel used by the automobile industry will be electrically treated. Much of the development of the automobile has been made possible by the adoption of electrical equipment in the factory and on the automobile itself. The steel industry, so closely associated with the automobile industry, is depending more and more upon electric applications in its processes. Thus two of the country's greatest businesses are finding that the solution of many perplexing problems lies in applying the service of the electrical industry.

Decorative Yuletide Lighting Outdoors

YULETIDE is a particularly appropriate time for stimulating interest in lighting and for establishing a closer acquaintance between the electrical interests and the public. Contests in outdoor Christmas lighting have been quite successful in communities where they have been well managed. The mood of the public at Yuletide is one of willingness and even desire to spread the spirit of Christmas far and wide. Outdoor lighting is a natural medium with which to express this spirit. Stimulating interest in such lighting by means of a contest or otherwise is a worthy enterprise, unimpeachable from the viewpoint of pure selfishness of the electrical interests fostering it. It is true that merchandise and electrical energy must be sold and purchased—but so it is with any worthy movement.

Communities in various parts of the land have already had some experience with an organized effort to stimulate outdoor Christmas lighting. In many of these the movement has grown from year to year. For example, in 1922 the Electrical League of Colorado began to spread the idea in Denver, and more than two hundred outdoor installations were made by individuals throughout the city. The number doubled in 1923. The next year a contest with prizes was inaugurated, and eight hundred displays were entered for consideration. In 1925 the number doubled again—sixteen hundred individual lighting displays were installed. Surely the effect upon public spirit was alone worth the effort, without appraising the other beneficial influences arising from the display. Such a movement is not difficult to get under way. The civic and artistic value of radiating the Christmas spirit appropriately and effectively by decorative outdoor lighting makes a strong appeal. A small, temporary organization beginning its publicity immediately following Thanksgiving Day can readily arouse the entire community.

The Form of Rate for Residence Business

IN BUILDING a larger residence load the business objective is to increase profits. The logical approach is to adopt a method or methods which will retain the present income and give a profit on the added business. Advantage must be taken of the economic law that a decrease in price reacts to secure an increase in sales. Thus added residence business is intimately connected with rates.

Added load means an increase in system investment for residence service which must earn profits. These may be obtained through increased sales of energy or by maintaining decreased or stationary investment and operating unit charges per customer, or by a combination of these elements. There is a condition for minimum costs and maximum profits for each utility at each successive stage of system growth. This makes it impossible to fix uniform prices for residence rates in this country or to retain the price on a single property unchanged over a period of years. But there is opportunity for the electrical industry to get a form of rate which will be uniform for each property and which will bring the desired business results with a minimum of disturbance. The present wide differences in rate forms are not conducive to good public relations, and many of them fail to take into consideration any inducement element. The form of rate is the largest factor in developing residence business.

The form of a rate is not a simple matter of statistics and cost analysis. Nor is it wholly a matter of opinion. Evidence is at hand as regards present usage, costs and profits. The possible market has been studied from the standpoint of magnitude, price and profit. Data over a period of years on many properties give several definite facts about the effect of rate forms on the growth and the profit in residence business. Experience shows also that almost any type or kind of rate can be sold to the public served by a utility. This statement is proved by the different forms of rates now in successful operation.

Although the industry is not agreed upon any one

of the many methods in use for collecting fixed charges and customer charges, many executives think there should be one uniform method. The public relation benefits would be enormous, and any loss in money to an individual utility would not be necessary. From the standpoint of rate simplicity, the argument is all in favor of collecting these charges as part of the energy rate.

The energy rate form, however, which will bring increased business and larger profits has been determined by experience on several properties. Briefly, the form consists of two or three blocks of energy at two or three prices. The first block should be narrow and the successive blocks should provide the inducement element. A "spread survey" of the energy use of the average of the majority of residence customers determines the minimum width of the first block needed to retain present incomes and profits. The "follow-on" blocks and rate steps can then be determined primarily from a study of kilowatt-hour consumption of various residential electrical devices, the probable number of customers using these devices and the price of energy which will encourage their use and still provide for costs and profits on the residence service investment of the system. Sticklers for precision in rate making should give way before the many large factors which indicate the public relations and commercial advantages of a uniform inducement type of residence rate for the electrical industry.

More Electric Range Economics

IN THE case of not a few light and power companies active progress in electric range business development is still retarded by the cross-fire of executive skepticism. Experience is telling, however, and results like those had at Buffalo (ELECTRICAL WORLD, May 15, 1926, page 1051) deserve careful study, together with the recent notable report of the N.E.L.A. range committee and an article published elsewhere in this issue analyzing the economic meaning of this class of business on an Eastern utility. These and other contributions to the writings now available on this topic point the way toward increased sales activity for companies which have hitherto been lukewarm in their advocacy of electric cooking.

The article just referred to is interesting as an example of analysis on a particular property which led to an executive decision to push range load building on a comprehensive scale. Previous experience elsewhere was drawn upon by the committee who prepared the report forming the basis of the story, and the method of attack on the problem is suggestive for general use. It is significant that the various analyses indicate increased profits to be derived of from 30 to 40.5 per cent on the business handled and increased returns on the investment ranging from 16.4 to 30 per cent. Excellent potential gains are apparent in the urban territory covered, and in a rural section analyzed the increased profit on the investment reaches the maximum, again emphasizing the importance of building up rural-line use of energy by devices like ranges, refrigerators and heaters. As might have been expected, the excellent diversity of range usage was effectively employed by the committee in its argument. Studies of this kind represent a great deal of hard work on the part of those who make them and are real contributions to the constructive thinking of the industry in this important field.

Distribution Problems Are Multiplying

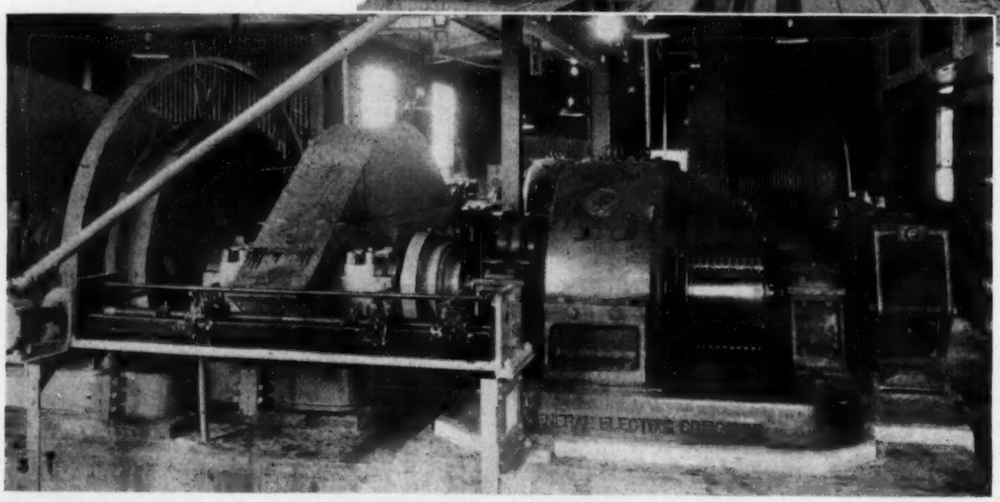
OPERATING engineers responsible for the distribution of energy on light and power systems met recently at a round-table discussion of mutual problems in one of the geographic sections of the N.E.L.A. Such informal gatherings do more good than not a few carefully planned convention sessions; but one of the most striking points about this meeting was the amazing variety of topics covered in after-luncheon give and take across the table and the equally surprising lack of standardization in practice evident from the remarks of those in attendance. The questions considered included such subjects as the desirability of doing away with painting and substituting therefor a light staining of cross-arms, the use of metal pins in place of wood, the use of special glass insulators instead of porcelain, how to occupy linemen on rainy days, methods of rebuilding lines without interruption of service, and other matters. Now and again the perennial problem of safety in distribution work came to the front, and at all times the importance of saving needless expenditures was clearly in the minds of those who discussed line construction and maintenance.

To a superficial observer it would seem as though the electrical industry was now old enough for some of these questions to have been settled once and for all. What could be simpler, from his viewpoint, than the maintenance of an 11,000-volt pole line, to say nothing of keeping circuits carrying energy at lower voltages in economic operation? Isn't it about time that engineers, superintendents and foremen agreed upon whether wooden poles should be painted and treated with preservative as a general practice, what types of insulators are best for distribution (not for transmission) service, and whether the line department or the stores department should be responsible for the preparation of line material for use?

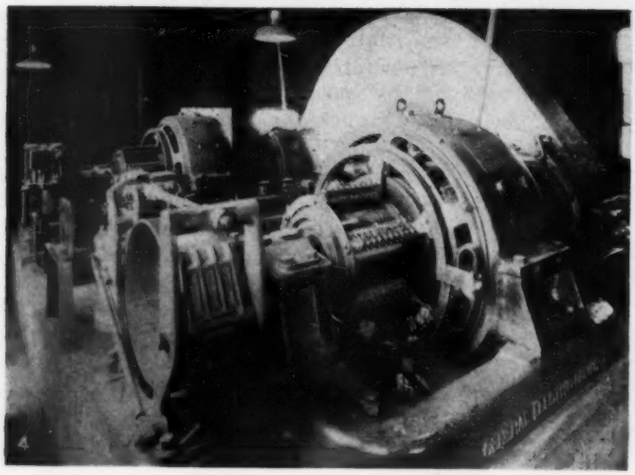
The answer is simply that nothing is final in applied electricity. The industry has grown so fast that many questions which were thought to be determined at one time or another by this or that group of engineers have never been permanently settled and, as a matter of fact, probably never will be. Certainly, as long as engineers are interested in forcing materials to the economic limit of performance, in cutting out wastes in labor and overhead charges, and in achieving better results at decreased operating and construction cost, the last word will not be spoken or written upon any of these topics. Only through the exchange of experience and ideas can progress be expedited and simplified, and the increasing pressure upon the distribution engineer to meet new conditions in circuit loading at lowered costs per kilowatt-hour delivered to the customer justifies the study and discussion of topics which might seem threadbare to those who do not look below the surface of current thinking in this and many other departments of utility service. Problems multiply yearly, and the vitality of their discussion in gatherings like the above is an index of the ability and leadership happily prevailing among distribution engineers from one section of the country to the other.

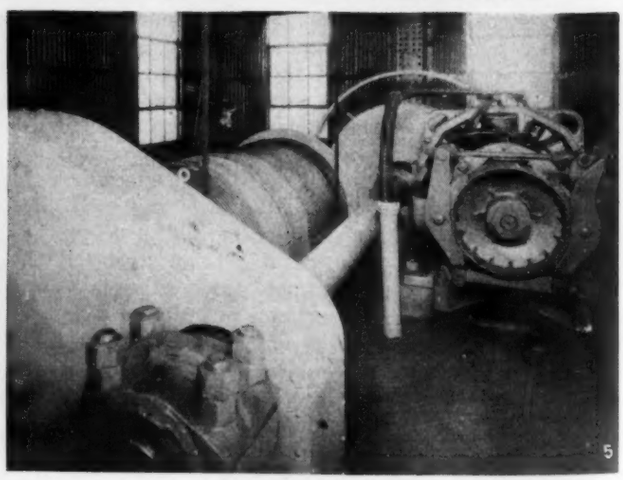
Electric Car Dumper at Great Lakes Port

AT THE Toledo & Ohio Central Railroad dock in Toledo is a 120-ton electrically operated lifting car dumper, shown in No. 2. The cradle-hoist drive showing the limit switch differential connected to the girder screw is illustrated in No. 3. Both the "mule haulage" (No. 4) and "cradle hoist" are operated by two 450-hp. motors and solenoid-operated brakes in series with the generator-field control. For the "pan hoist" a 295-hp. motor and solenoid-operated brake are used (No. 4). In No. 1 are illustrated the contactors controlling the cradle hoist and haul by generator-field adjustment.



Photos by courtesy of the General Electric Company





Speeding Traffic with Light Signals

Characteristics Which Are Desirable in Different-Purpose Signals—Optical Means for Providing Effective Distribution of Light—Methods of Furnishing Flexible Control for Speeding Up Traffic on Main Thoroughfares

By CARL E. EGELER
Commercial Engineer National Lamp Works, General Electric Company

TO KEEP traffic moving faster and more smoothly is the ever-pressing problem of our municipalities. The enormous growth in the use of motor vehicles has been made possible chiefly by two factors—widened streets and new thoroughfares, and light signals that serve in the policeman's place in expediting traffic. At the busiest corners an officer remains on duty, but no longer is he required at the center of the intersection to give signals; he circulates wherever he may be needed to look after pedestrians, give information or prevent a tangle of vehicles.

There are so many things that the driver of the moving vehicle must watch, so much that may distract his attention, that he should be guided by a signal that forces itself instantly upon his consciousness, by something that compels attention and action. Experience has demonstrated that many signals now in service are not as compelling as safety and maximum traffic movement demand; they must be effective against even the brightest sky. The eyesight of those who must obey the signals varies through a wide range, and those with poor vision should be given special consideration. Their ages and their reactions differ widely, too, and the pedestrian or driver who acts slowly needs a more effective indication than does the alert type.

FIG. 1—WARNING BEACON FOR DANGEROUS LOCATIONS

Light aids traffic movement in four ways: (1) Guides by marking the pathway; (2) cautions at dangerous places; (3) illuminates boulevard or through-street traffic signs; (4) directs when to stop and when to proceed.

Guides or Street Units.—Placed nearly flush with the surface of the street, heavily protected lighting units serve to mark traffic lines in wide boulevards, to keep vehicles from cutting corners and to guide their course where there might otherwise be confusion. The protecting casing is a warning obstruction in daytime, and at night the yellow or amber waterproof glass cover sends light in all directions to tell the driver where to turn. Two or three 50-watt standard multiple lamps furnish sufficient brightness for these guide units.

Warning Beacons.—A flashing light beacon attracts attention at dead-end streets, bad curves and irregular crossings, and gives a warning to proceed cautiously. The signal, mounted 6 or 7 ft. above the roadway, is flashed by an automatic mechanism located in the base; equal on and off periods, each of about one-half second duration, have been found effective. Amber lenses are generally used. A vertical spread greater than 10 to 15 deg. is of no advantage and, except at dead-end streets and on curves, a horizontal beam spread of about 90 deg. is required for each lens. The special 60-watt traffic signal lamp should be used in reflector units, and the standard 150-watt lamp should be used when lenses on four sides are employed with one lamp. For dead-end streets and bad curves where night warnings suffice, the 40-watt inside-frosted lamp with a single lens of 30 deg. spread can be used. The base of the beacon should be painted white and illuminated by a standard 50-watt inside-frosted lamp.

Stop Signs.—Where signs are used to stop traffic approaching main thoroughfares, boulevards or railroad crossings, it is seldom that street lighting is sufficient to give them the necessary prominence. These signs should combine illumination of the wording with a warning beam projected by a lens. The signal may be connected either to the regular multiple service or to the street-lighting circuit. The 60-cp. street series or 60-watt traffic signal lamp may be employed.

Stop-and-Go Signals.—In congested districts and on thoroughfares traffic is controlled best by colored light signals. The code that has become universal is a green light to indicate "go" and a red for "stop." In addi-

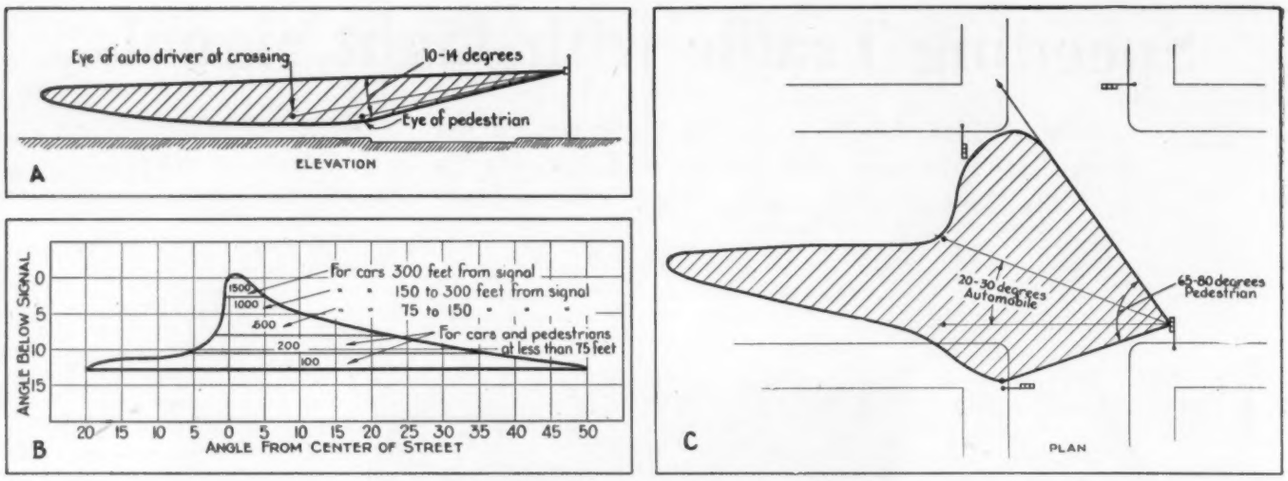


FIG. 2—REQUIREMENTS OF FAR CORNER SIGNAL

A, Vertical section of light distribution; B, plan of light distribution; C, minimum intensities of light for an effective signal.

tion an amber is usually included to indicate a change, or it may be used for "pedestrians go" in all directions. The design of the system involves location of the signals for most convenient viewing, light distribution to give proper brightness at all angles from which the signal will be observed, and control of the cycle of changes in color to give maximum safe traffic movement.

Location of Signal.—To be most effective the signal should obviously be located at the most convenient viewing angle for all approaching traffic, both automobile and pedestrian, and therefore as near the normal line of vision as possible. Three locations are most feasible: (1) On posts at each far corner of an intersection; (2) suspended at the center of the intersection; (3) on a post or tower at the center of the intersection.

Bracket signals, mounted about 14 ft. high and extending 4 to 8 ft. beyond the curb at the far corners, always have an advantage in visibility. They are adapted to all types of intersections and are especially valuable when one of the intersecting streets is narrow. Among the advantages are the following: Signal is close to normal line of sight; light is required through smallest angle, permitting maximum brightness for a given wattage; furnishes most definite signal for pedestrians, since there is a separate unit for each lane of traffic easily seen by automobile drivers waiting for left turn; street cars do not obstruct view of signal; readily accessible for maintenance; least confusion with commercial signs and other lights. The total cost of installation for a corner bracket system is somewhat higher than for pendent signals—perhaps 15 to 20 per cent, depending on local conditions. However, in view of their many advantages they are recommended; the additional expense is well warranted.

Pendent signals suspended at the centers of the intersections about 14 ft. above the pavement have the advantage of somewhat lower installation cost. Their disadvantages are: Signal usually so far above normal line of sight from the nearest cars that it is obstructed by automobile sun visors; light must be directed through about double the vertical and horizontal angles to serve the same traffic area, giving lower signal brightness; both "stop" and "go" signals on same unit visible to pedestrians on corners, often causing confusion; drivers waiting to make left turn find it difficult to watch signal; street cars may obstruct view of signal. How-

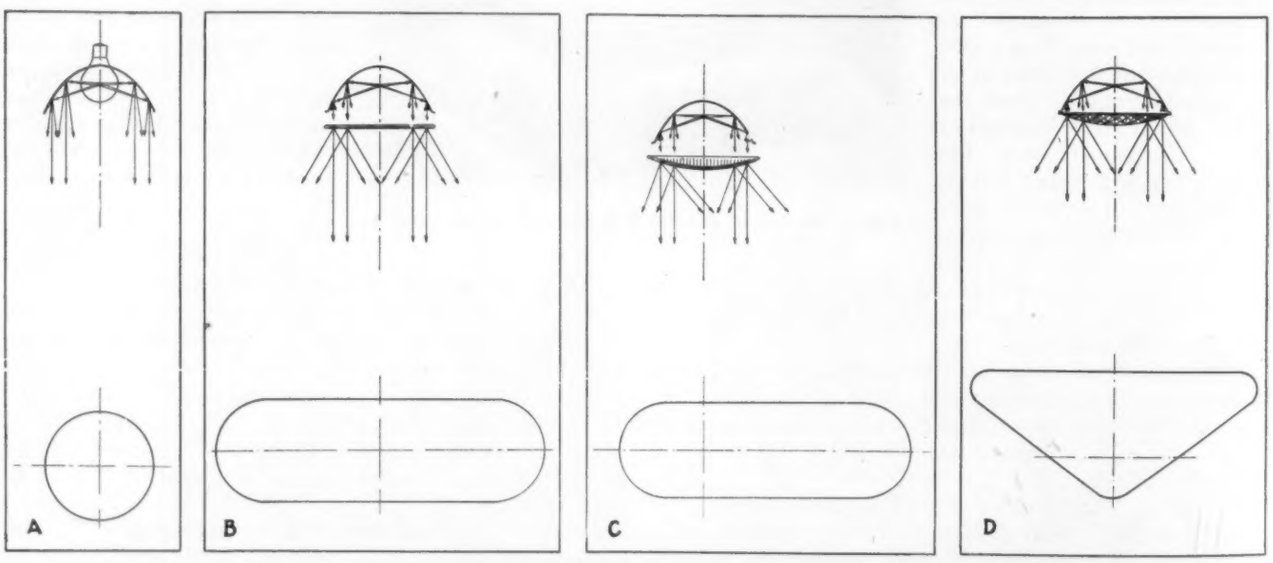


FIG. 3—PRINCIPLES OF LIGHT CONTROL ENTERING INTO THE DESIGN OF TRAFFIC SIGNALS

A, parabolic reflector alone; B, reflector plus symmetrically fluted lens producing equal sidereal refraction; C, asymmetrically fluted lens for side displacement of beam; D, combination of horizontal and vertical flutes for downward and sidereal light throw.

ever, where signals are operated in synchronism at adjacent, closely spaced intersections, straight-ahead traffic has little difficulty, since the signal at the second or succeeding corner is readily observed.

Post signals located at the centers of intersections have essentially the same cost advantage as the pendent signal, and where there are no street cars they are usually more easily seen, provided they are kept 8 to 10 ft. above the pavement. A tower structure, however, becomes much more expensive. A tower is chiefly of service in affording a place from which an officer may view long lines of traffic and direct the controls. For isolated intersections in small towns and on wide boulevards the posts prevent cutting turns too short, but this feature is largely offset by the added collision hazard. Experience shows that maintenance in many such cases is markedly increased. The base of the post should be painted white and illuminated by a 50-watt standard lamp.

Light Distribution.—To command attention and action from both drivers and pedestrians equally well from all angles and at various distances and to do this with a minimum amount of light or wattage a signal should present different brightnesses in the several directions from which it is observed. The slower vehicles and the pedestrians do not require as great a brightness as does the faster automobile traffic.

A signal, to be seen by the automobile traffic, requires the higher brightnesses only in a zone of about 10 to 14 deg. vertical depth, and 20 to 30 deg. width, as is indicated in the upper and center of Fig. 2. For pedestrians lower intensities through a zone 65 to 80 deg. wide suffice. (The limits of these angles vary with the width of the street.) This zone is not symmetrical; the lower drawing of Fig. 2 shows a pattern of the light beam that meets the requirements for a signal located on a bracket at the far corner. Light in the top zone is sent farthest down the street to drivers 300 ft. or more distant, for whom the greatest brightness is required. The pedestrian being close to the signal and with less to watch is served by a much lower signal brightness.

To direct the light in the manner indicated two common methods are employed. The first is the use of one lens to collect light for redistribution by a second lens. In this case one lamp is used with lens combinations on four sides. The light emitted by this unit is intercepted through an angle of about 78 deg. by the collecting lens; it is sent to the distributing lens in slightly diverging rays and the flutes and prisms of the distributing lens direct the light sidewise and downward.

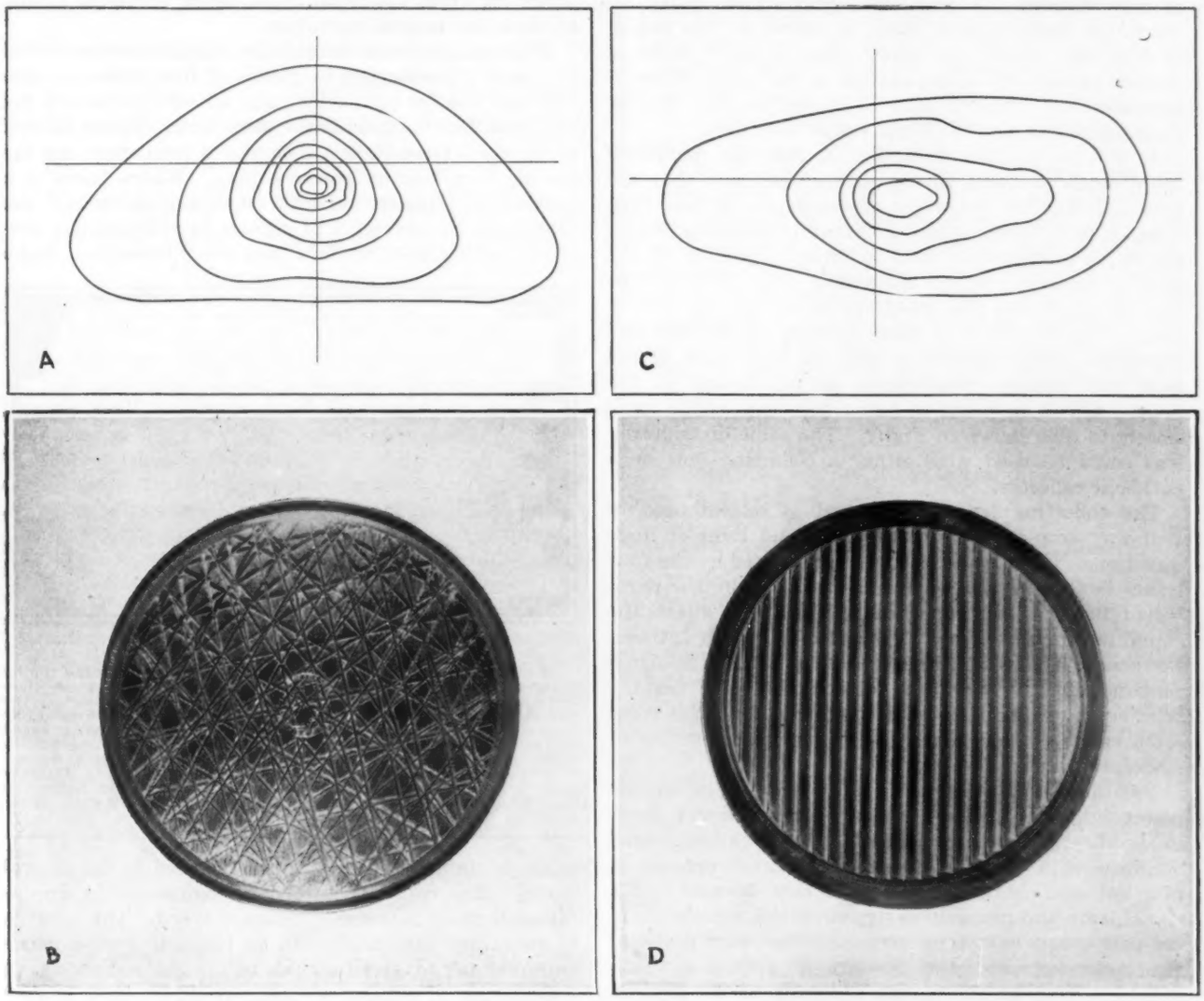


FIG. 4—A AND B, LENS FOR SYMMETRIC DOWNWARD THROW AND VERTICAL SECTION OF BEAM SHOWING LINES OF EQUAL CANDLEPOWER; C AND D, LENS FOR ASYMMETRIC DISTRIBUTION AND VERTICAL SECTION OF BEAM

The second practice employs the efficient mirrored-glass parabolic reflector, which intercepts a very high proportion of the light from the lamp and directs it into a conical beam, as shown in Fig. 3a. With the lamp used in traffic signals the spread is about 15 deg., which is also the required vertical spread shown in Fig. 2. The beam desired, however, has a width of 65 to 80 deg. This greater horizontal spread can be obtained by placing a lens with vertical flutes or refractors in front of the reflector. A lens with symmetrical flutes refracts the light to both sides, as shown by the sketch of Fig. 3b. Since over three times as much width is desired on one side of the axis as on the other, flutes of asymmetrical contour, such as shown in Fig. 3c, can be employed to give the beam shape indicated.

It will be recalled from Fig. 2 that the maximum beam depth of about 15 deg. is required only near the axis and that for the wider angles depths of less than 5 deg. suffice. Accordingly, horizontal refracting prisms should be employed as well to direct a portion of the light at the wider angles downward (Fig. 3d). A lens that accomplishes this result is shown at the left in Fig. 4, together with its beam pattern. Since this lens furnishes equal amounts of light on both sides of the axis, still further modification in the design of the prisms should be made to bring the beam shape more closely to that shown in Fig. 2. The same distributing lens could be used with either a collecting lens or a parabolic reflector.

The collecting lens arrangement is seldom used in four-way stop-and-go signals that send light in four directions. The amount of light intercepted by the four lenses is only 84 per cent of that utilized by the parabolic reflector system, and failure of the lamp affects the signal in four directions. The reflector system is therefore more efficient, and when an outage occurs the signal remains effective in three directions. For flashing beacons the single-lamp four-lens arrangement is more often employed with a relatively simple construction of moderate cost.

New Mazda Lamp for Traffic Signals.—The candle-power figures shown in Fig. 2 are suggested as a guide in specifications for light signals. These values are not obtained with some of the equipments at present in use, but are obtainable with the new 60-watt traffic signal lamp and properly designed optical elements. In the past lamps have been employed that were designed for other services; the obsolete 50-watt P-19 bulb mill type lamp has been very generally used. This is, to be sure, a rugged lamp, but one made for services in which efficiency and maintained brightness are not important factors. For this reason there has been made available a new 60-watt Mazda C clear lamp, designed especially for traffic signals, which gives an average signal brightness 50 per cent greater than the obsolete 50-watt mill type lamp for an increase of only 20 per cent in wattage. This lamp has a semi-concentrated light source which in the standard parabolic reflectors gives a vertical beam spread, without the use of refracting prisms, of about 15 deg., meeting the requirements for bracket signals. The filament or light source is closer to the base, so that it reduces the amount of extraneous light reflected to the focus by the bulb surface and eliminates false or phantom signals.

In order to adapt these lamps to old equipment without any change it was necessary to give them dimensions that make them suitable for horizontal or base-down burning; hence for illuminating the post bases where the lamp is burned in base-up position the standard 50-watt inside-frosted lamp should be used.

Control System.—For isolated intersections control of the signals is best accomplished with a motor-driven automatic switching mechanism placed on a post at one corner. Such devices are adjustable as to total time of cycle and division among the colors. In an emergency or when the traffic is heavy or irregular an officer can sometimes operate the signals to better advantage by departing from the usual cycle, hence provision should be made for manual operation.

With synchronous control the signals are connected to a central mechanism by means of four wires (a common and one for each color) and all corners receive the "go" and "stop" signal at the same time. Relays located at remote intersections are employed for connecting the signals to a near-by power supply. Where there is a number of closely adjacent intersections along the thoroughfare, operation of signals in synchronism prevents a piling up of traffic at any one intersection. When

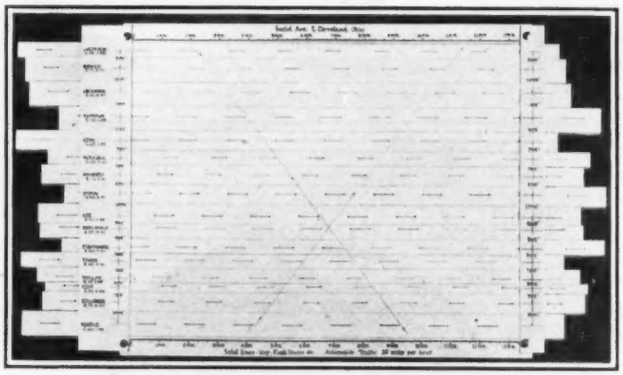


FIG. 5—SIGNAL TIMING MODEL

In order to simplify the determination of the best traffic timing a signal timing model was designed similar to the above illustration. Strips of white cardboard, on which are marked the apportioned time allowed for stop and for go on an avenue, as determined by traffic surveys, are mounted upon a drawing board in such a way that they can be moved to the right or left in order to find the most favorable timing schedule. If it is desired to investigate the varying results to be obtained with a different total time of cycle it is merely necessary to change the horizontal time schedule at the top and bottom of the board, with a corresponding change in the slope of the automobile speed line.

traffic is stopped the cars are distributed in the several blocks. The result is an orderly movement in groups rather than an increase of average speed. The effect is to encourage fast driving in an effort to pass a maximum number of green signals before the red shows.

Obviously if groups of traffic could be kept in continuous motion, with no stops necessary, a maximum amount of traffic could be handled. By controlling each of the intersections independently from a central point and timing the "go" and "stop" indications for the main thoroughfares to accord with the distances between intersections and the speed with which the particular density of traffic can move safely, it is possible to have "go" signals appear in progression along the thoroughfare and thus to permit a fairly high average speed with very few stops. Wherever conditions permit its use, this progressive or co-ordinated system of control has great advantage. The city of Chicago has had much success in thus directing traffic in its Loop district from a single point. Some of the advantages of progressive control may be obtained without the complete co-ordination of the system, by a modificaton of synchronous control; the connections at alternate intersections (or groups of two or three) are reversed to show "go" at one while "stop" shows at the next.

Economic Benefits of the Electric Range Load

Analysis of Business from Investment and Operating Viewpoints Convinces Executives that Electric Cooking Should Be Pushed—Profits from Range Business in Urban and Rural Districts —Major Steps Required to Launch Range Campaign

THROUGH the courtesy of a large electric light and power company serving both urban and rural areas in the East the "Electrical World" is permitted to publish this analysis of the economic value of electric range business to this utility as determined by a special committee report designed to get to the bottom of the subject from the cost and revenue standpoints. When the investigation was begun, there were, in the words of the sales manager, many "Doubting Thomases" in the executive circles of the organization. As a result of this study, to which formerly skeptical committee membership contributed as well as members convinced at the start of the value of the range load, the decision was reached to go "Full Speed Ahead" with ranges, and it is expected that the water-heating problem will be approached along similar lines. No apologies are offered for the length of this article, for it attacks the problems of electric range economics in an unusually clear-cut and comprehensive way, and should be highly suggestive to executives and sales managers in both manufacturing and utility circles.

IN VIEW of the lack of specific knowledge as to the cost of supplying the electric range business and the general feeling among members of the staff that the electric range business was not a profitable load to be encouraged, there was appointed a committee to make a detailed study and report on the electric range load as applied to one large company serving both urban and rural areas in the East.

Most of the members of this committee at some time felt that the electric range load was not profitable at rates that were necessary to get the business and that wide adoption of the electric range would be unattractive to the company. This fact is brought out for the reason that the results and conclusions of the committee are more than conservative, all charges that could properly be allocated against the electric range having been considered.

CONCLUSIONS

1. The net result of the committee's study is the inevitable conclusion that in almost all if not in all cases the addition of a range load increases the return on the existing investment or gives an increased return on the combined old and additional investment where additional investment is necessary.

2. The report of the N.E.L.A. range survey committee is a very excellent work and deserves careful reading by all electric utility executives.

3. The electric range is a desirable and a highly profitable load and should be encouraged in every way.

4. The electric range business is almost a necessary load to develop in order to make the future extensions for residence business (suburban and rural) profitable.

5. The committee should be continued for a further study of the electric water heater load, which would seem to offer possibilities equaling that of the range.

6. The committee believes we can now secure considerable profitable water heater business under our 3-cent energy rate and should encourage this business subject to careful analysis of proper equipment and proper installation.

The engineering members of the committee have made a study of capacity requirements for both generating and distribution, and in so far as possible the investment values for distribution and generating capacity have been collected.

A very striking feature of the electric range load is the great diversity as between ranges—in other words, although the load of an individual range may be considerable, the load per range decreases very rapidly as ranges are added. Table I was taken from the range survey sub-committee report of the N.E.L.A. The experience of the company, although limited, tends to confirm these figures.

TABLE I—RANGE DIVERSITY FACTORS

Number of Ranges	Demand per Range, Kw.	Number of Ranges	Demand per Range, Kw.
1	3.85	40	1.00
5	2.00	50	0.95
10	1.30	100	0.90
20	1.10	160	0.87
30	1.05	5,000	0.70

Loads.—From an analysis made the following loads were determined for the average residence customer:

	Station	Distribution
Demand of lighting customer, watts..	150	200
Demand of 7-kw. range only, watts...	700	1,000
Demand of lighting and range, watts.	825	1,150

Station Investment.—In the main districts of the company capacity costs for residence service were determined as follows:

	Per Kilowatt
Generating plant	$146
Transmission	31
Substation	25
Total station cost	$202

Distribution Investment.—From previous studies it was estimated that the average distribution investment per customer in the main districts of the company is $62 per customer and that for 20 per cent range saturation the investment for lighting and range service will be $102.83 per customer, this latter figure taking into

account a pro rata amount for added line capacity for each range, with no allowance for present distribution line capacity in excess of present residence requirements, although in many localities there is, or shortly will be, spare distribution line capacity in excess of the present residence requirements that is or can be used within the next few years unless the range business is developed.

The gas send-out curves of the company and the company's limited experience with electric ranges and the range survey figures all tend to indicate that there is not much diversity as between the range load and the lighting load. There is some, but great diversity cannot be claimed. Although in many instances no addition will be necessary to the distribution circuits, there will almost always be increased investment for transformers, services and meters applicable to the individual consumer. The figures vary, depending upon conditions and especially whether an individual transformer is required for the consumer or whether he can be grouped with others. The total for these three items will run from $20 to $30 per consumer.

Sales and Revenue.—In view of the difference in rate and difference in operating costs in the various districts the average sales, revenue, cost figures and rates are given for the "A" and "B" districts.

The average use per residence customer in those districts in 1925 was 294 kw.-hr., yielding $24.96 under the residence rate of:

Flat rate: 50 cents per month plus 4 cents per 100 sq.ft. of floor area, plus an energy rate: 5 cents per kilowatt-hour.

The average use per residence customer with an electric range was 1,794 kw.-hr., yielding $87.60 under the lighting and cooking rate of:

Flat rate: $2 per month plus 8 cents per 100 sq.ft. of floor area, plus an energy rate: 3 cents per kilowatt-hour.

Returns from the average residence business with and without the electric range were found to be as shown in Table II.

TABLE II—ELECTRIC RANGE BALANCE SHEETS, "A" AND "B" DISTRICTS

Investment	Without Range	With Range	Additional from Range
Station pro rata	$30.30	$166.65	$136.35
Distribution	62.00	102.83	40.83
Total	$92.30	$269.48	$177.18
Revenue	$24.96	$87.60	$62.64
Sales in kilowatt-hours	294	1,794	1,500
Net rate, cents	8.5	4.9	4.17
Expenses			
Production	$3.68	$18.68	.....
Distribution	2.48	4.11	.....
Commercial and sales	2.75	2.75	.....
General and taxes	3.23	9.78	.....
Depreciation	4.63	11.17	.....
Total	$16.77	$46.49	$29.72
Net profit	$8.19	$41.11	$32.92
Per cent return on investment	8¼	15¼	18.6

It was felt by a majority of the committee that it is unsafe to apply merely average estimates of distribution investment for the range load, for the reason that in areas where the population is dense there is less present prospect of electric range business in competition with gas and that certain definite distribution areas, both city and outlying, should therefore be analyzed.

For this purpose three circuits were studied in detail and profit and loss statements applied:

"C" Street Circuit Figures 16.4 per Cent Added Profit on Range Load.—This is a circuit that has a short length of subway with the remainder overhead, feeding a mixed business and residence section with 3,730 customers, of whom 90 per cent are estimated as residential. It includes a fair number of small apartments, multi-family houses and single houses, substantially built up and comprising a fairly representative class of customers.

TABLE III—RANGE BALANCE SHEET, AREA SERVED BY "C" CIRCUIT

Investment	Without Range	With Range	Additional from Range
Station	$30.30	$166.65	$136.35
Distribution	75.00	130.39	55.39
Total	$105.30	$297.04	$191.74
Revenue	$25.78	$88.71	$62.93
Sales in kilowatt-hours	305	1,805	1,500
Net rate, cents	8.45	4.9	4.2
Expenses			
Production	$3.81	$18.81	.....
Distribution	3.00	5.22	.....
Commercial and sales	2.75	2.75	.....
General and taxes	3.50	10.38	.....
Depreciation	5.41	12.82	.....
Total	$18.47	$49.98	$31.41
Net profit	$7.31	$39.13	$31.52
Per cent profit on investment	6.9	13.2	16.4

The present circuit devoted to residence service is estimated to have cost slightly more than $250,000 and supplies 3,357 residences, giving an average distribution investment of $75 per residence.

The circuit has a capacity of 1,200 kw. and a load of 800 kw. The limit of territory that can be supplied from the circuit with proper regulation has been reached, hence the spare capacity must be sold in the area now covered by present customers. This indicates that there is at present capacity for 400 ranges within the area, but since it is not felt safe to fail to allow added line investment, it was determined that for an added expenditure of $27,000 the capacity of the line could be doubled and that, charging all of the added capacity to the range load, the average distribution for a lighting and range customer at 25 per cent range saturation would be $130.39.

Although the sales and revenue for both lighting and ranges would probably be larger in this section than the average of the "A" district, the average district figures have been applied with the comparison shown by the figures in Table III.

These figures apply to 840 ranges and leave capacity for approximately 600 added ranges that could be supplied without additional money being spent for further line capacity, and these extra ranges yield an increment return of 20.5 per cent instead of 16.4 per cent.

"D" Circuit Figures 17.2 per Cent Added Profit on Range Load.—It was felt that the range business could be more easily developed in non-gas territory and a circuit was therefore picked out in "D" as a good example of scattered residences of above the medium class. This circuit consists of 22 miles of primary and 17 miles of secondary estimated to cost $70,000, excluding transformers, services and meters. It serves 325 customers with a load of about 65 kw. and a capacity of about 69 kw. Line capacity will soon have to be added for present load and it is estimated that by spending $5,000 to extend some three-phase circuits the capacity could be increased to 150 kw. or by spending $7,500 to extend the same three-phase circuits with No. 2/0 copper the capacity would be increased to 800 kw. This

work has been authorized and scheduled for this summer for reasons other than range capacity.

From a new-business standpoint it would seem that this territory would be susceptible to a greater range saturation than the average and on the basis of 60 per cent saturation the comparative profit-and-loss statement shown in Table IV should obtain, when charging the added line capacity to range load.

TABLE IV—RANGE BALANCE SHEET, "D" AREA

Rates:

Residence Service: Flat rate: 60 cents per month plus 5 cents per 100 sq.ft. floor area plus energy rate; 6 cents per kilowatt-hour for first four kilowatt-hours per 100 sq.ft.; 5 cents per kilowatt-hour for remainder.

Residence Lighting and Cooking:

Flat rate: $2 per month plus 8 cents per 100 sq.ft. floor area plus energy rate; 5 cents per kilowatt-hour for first four kilowatt-hours per 100 sq.ft.; 3 cents per kilowatt-hour for remainder.

Investment	Without Range	With Range	Additional from Range
Station	$34.85	$191.65	.....
Distribution	244.00	322.50	.....
Total	$278.85	$514.15	$235.30
Revenue	$40.80	$126.72	$85.92
Sales in kilowatt-hours	400	2,800	2,400
Net rate, cents	10.2	4.5	3.58
Expenses			
Production	$5.00	$29.00	.....
Distribution	9.76	12.90	.....
Commercial and sales	2.75	2.75	.....
General and taxes	7.61	16.63	.....
Depreciation	15.69	24.85	.....
Total	$40.71	$86.13	$45.42
Net profit	$0.09	$40.59	$40.50
Per cent profit on investment	0	7.9	17.2

In these figures $30 per kilowatt has been allowed for added transmission to the center of distribution in "D." No credit has been given for a greater diversity factor on the ranges in this territory, which has a combination small town and commuting population.

"E" Extension Figures 30 per Cent Profit on Range Load.—As a purely small town and rural section the recent *"E"* extension was studied. Although a year's revenue figures were not available, it is running sufficiently close to the estimates to apply the estimated figures. This extension consists of a twelve-mile run to supply 58 residences, including nine ranges, four stores, two small motors and seventeen street lights in a typically country section. The extension cost $25,800, has a capacity of 150 kw. and a load of approximately 20 kw. There are about 25 other prospective residence customers and 20 kw. of possible power load, which would add about 10 kw. to the present 20-kw. peak when diversity between power and lighting is considered. This leaves spare capacity of approximately 120 kw. for sale before added investment in distribution must be made. Complete range saturation would take but 74 kw. of this capacity.

It is clearly evident that the electric range business when added to the present residence business on present rates is highly profitable and in general doubles the return on the present average residence customer. It is conceivable that there will be some circuits where the addition of a range load will call for the addition of a considerable investment, which may for a time at least make that additional investment non-paying. However, these cases will be few. On the other hand, there are many cases where the present circuits are not loaded and probably cannot be loaded except by range loads. In such cases there will be practically very little added cost chargeable against the ranges. There will be none as applied to the circuits and only those added costs due to the larger size of the transformers needed for the particular range customer. There will be other circuits that may be nearly loaded as they stand but that can have their capacity increased in various ways. The most usual way will be to run a second circuit on an existing line of poles. This added cost will therefore be very much less than the cost of the original circuit. Ranges can be given the benefit of the increment cost in all such cases.

The decision of the management that the range business is highly desirable and should be very strenuously pushed is very simple in comparison with the problem of developing the electric range business. It is a problem of educating not only the customers but every one in the company to the point of co-operation.

The advantages of electric cooking must be generally understood by the community. In some communities in the West and South where the idea of the range has been appreciated, communities smaller than this territory are buying from 2,000 to 3,000 ranges a year; this where rates are similar to these and gas in the neighborhood of $1 per 1,000 cu.ft. If it is to be successful in developing the range load, the committee believes that the following steps are among those that must be taken:

1. Realize that we have the opportunity in the cooking field to repeat the history of lighting development.
2. Realize that electric cooking is not more expensive but probably less expensive than other means of cooking.
3. Realize that more than 360,000 ranges are in use and that the average consumption of more than 20,000 ranges for which records have been obtained is less than 125 kw.-hr. per month and that under our rates this would be about $5 per month.
4. Realize that the modern range is quick and efficient.

TABLE V—RANGE BALANCE SHEET, "E" EXTENSION

Rates:

Residence: Flat rate $1 per month plus 10 cents per 100 sq.ft. area plus energy rate; 8 cents per kilowatt-hour for first two kilowatt-hours per 100 sq.ft.; 5 cents per kilowatt-hour for remainder.

Investment	Present Business	100 per Cent Range Saturation	Additions from Range
Plant	$2,948.00	$9,318.00	.....
Distribution	25,800.00	27,270.00	.....
Total	$28,748.00	$36,588.00	$7,840.00
Revenue	$4,754.00	$8,429.00	$3,675.00
Sales in kilowatt-hours	30,000	103,500	73,500
Net rate, cents	15.8	8.1	5
Expenses			
Production	$300.00	$1,035.00	.....
Distribution	1,032.00	1,090.80	.....
Commercial and sales	186.00	186.00	.....
General and taxes	520.18	782.33	.....
Depreciation	1,378.44	1,643.04	.....
Total	$3,416.62	$4,737.17	$1,320.55
Net profit	$1,337.38	$3,691.83	$2,354.45
Per cent profit on investment	4.65	10.1	30

5. Realize not only that it is cool, convenient and clean but that it can be made automatic and permit the housewife to spend the day away from home and return fifteen minutes before serving a hot meal of a meat and three or four vegetables.
6. Realize the intangible saving in meat shrinkage that in some instances is sufficient to equal the entire cost of electricity for cooking.
7. Realize that ranges are in the promotional stage in our state and cannot as yet be handled as an ordinary piece of merchandise. It must be remembered that the

gas range had to be given away in the early stages of its development.

8. Realize that members of the staff should use electric ranges in order to know from experience the low operating costs and other advantages of electric cooking.

9. Realize that they should make sure that every employee in their districts and departments appreciates the advantages and inexpensiveness of electric cooking and is encouraged to adopt it as a matter of company pride and policy where the company does not sell gas.

10. Realize that every available opportunity should be taken to talk about the advantages of the range in their own homes.

11. Realize that the management must consider the effect of bi-monthly billing as a check to range sales and greater development of sales of other heavy consuming devices for residence use.

12. Check up to see if the service department is set up to follow installations properly.

13. Co-operate fully in and offer helpful suggestions toward all sales activities, especially in the present program, which is as follows:

a. Special campaign on ranges during month of June with special advertising in newspapers and three broadsides to a selected list of customers in non-gas territory.

b. Demonstrations before women's clubs.

c. Effort to have all contractor-dealers co-operate.

d. Effort to have all contractor-dealers wire new houses for electric ranges.

e. In co-operation with the range manufacturers to get a proper electric range equipment in every school having a domestic science course and co-operate with teachers to tell advantages of electric cooking and so sell the idea to the future housekeepers and incidentally get the advertising value of such education for immediate sale of ranges.

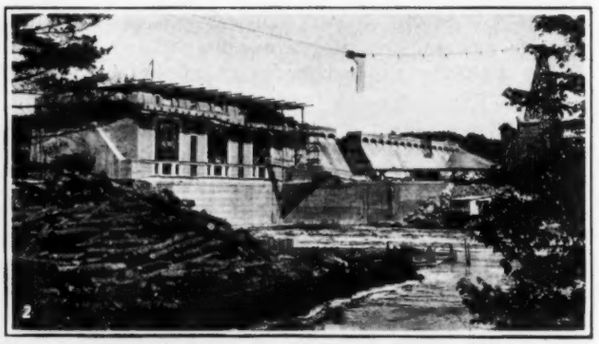
f. Organize in each district proper personnel to (1) work closely with architects and speculative builders to the end that they will specify and install electric ranges in new homes; (2) follow all new construction to insure proper wiring and sell range before occupant has purchased a new stove; (3) work up co-operative activities with contractor-dealers.

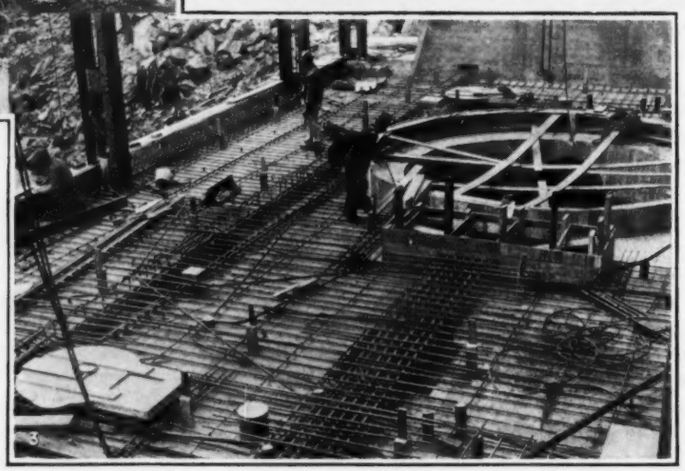
By proper promotional work we should be able to get the following number of ranges on our lines:

	Number of Ranges	Cumulative Added Revenue
1926	200	$13,000
1927	600	$52,000
1928	1,000	$117,000
1929	1,500	$214,500
1930	2,000	$344,500

27,000-Hp. Hydro-Electric Development at Gulf Island, Me.

AT AN estimated cost of $5,000,000 the Central Maine Power Company is building a 27,000-hp. plant on the Androscoggin River 5 miles above Lewiston and about 1 mile above the existing Deer Rips hydro station. Three 9,000-hp. units operating under 50-ft. head are due to go into service early in 1927, completing the installation. The development includes a concrete dam and integral power house, with outdoor switching station through which the plant will be interconnected with the leading Insull properties in eastern New England. The dam is 2,600 ft. long and 110 ft. high (maximum), and the completion of this development will stabilize the flow of water sufficiently to increase the output of its Deer Rips station by about 5,000 hp. This result is an interesting by-product of the project.





27,000-Hp. Hydro-Electric Plant Nearing Completion

1. View of dam and power house from cableway tower.
2. Power house and bulkhead section of dam.
3. Laying reinforcing rods and conduit in generator room floor.

Factors in Overhead Line Clearances

Results of a Comprehensive Study of Sag-Span Relations in the Design of Aerial Lines—Fallacy of Assuming Change in Sag Increases Indefinitely with Increase in Span Demonstrated

By W. C. WAGNER
Engineering Department, Philadelphia Electric Company

IN THE DESIGN of aërial lines the heights of supporting structures must be such as to provide for (1) minimum allowable vertical clearances of conductors, (2) sags at stringing tensions and (3) the maximum increase in sag that will occur whether due to increase in temperature or to ice loading. It has been customary to specify clearances for stringing conditions (60 deg. F., no wind, no ice) greater in the cases of span lengths of several hundred feet or more than for shorter spans, the increase in stringing clearance generally having been required to be proportional to the increase in span length.

The results of a recent comprehensive study of sag-span relations, extending into elastic catenary characteristics and including a considerable range of conductor sizes, spans and assumed ice and wind loadings, indicate an important modification of the above-noted requirement by showing that for an increase in span length the change in sag from stringing conditions to assumed conditions of loading or temperature is not proportional to the increase in span length. On the contrary, at some span length such sag change reaches a definite maximum for each conductor condition and beyond that span length the sag change in general decreases. This shows that a requirement specifying increases of clearance directly proportional to increase of span, increasing indefinitely with increase in length of span, is wrong and that it places an unnecessary burden on the industry.

This situation is shown graphically in Fig. 1, in which the unnecessary height of poles or towers is indicated at *C*.

The National Electrical Safety Code of 1920 outlines: "Three districts . . . in which heavy, medium and light loading, respectively, are considered to be justified by weather reports as to wind and ice and by local experience of the utilities using overhead lines. The localities in the different groups are classed according to the relative prevalence of high wind velocity and thickness of ice which accumulates on wires, light loading being for places where little if any ice ever accumulates on wires."

It should be noted that the loadings specified by the Safety Code for these districts are not necessarily the greatest possible loads but that the specified loadings insure a quality of materials and workmanship which experience in general has shown to be trustworthy.

The code of 1920 specifies clearances above railways, roadways and footways for spans up to 150 ft. at 60 deg. F., no wind, these clearances being the sum of the clearances actually desired and the increase in vertical sag which, according to the Code, is assumed likely to occur. (See *A*, *B* and *C*, Fig. 5.) For spans longer than 150 ft. the maximum change in vertical sag with loading has been assumed to be greater than for spans of 150 ft., and the code therefore provides that the clearances shall be proportionately increased. This is accomplished by applying an increment to the clearance at 60 deg. F., no wind, over that required for 150 ft., the increment being a function of the length of span and increasing indefinitely in proportion to the length of span.[1] The increment for spans between 150 and 300 ft. in length is indicated by the portion of the curve marked 1, and the rate of the increase is indicated by the slope of this portion. Similarly, the portion of the

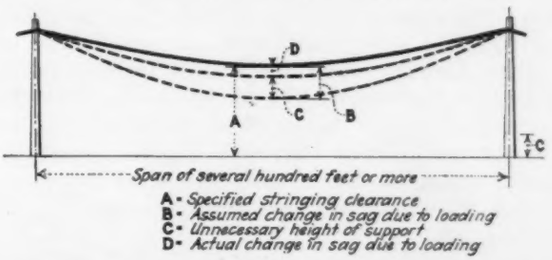
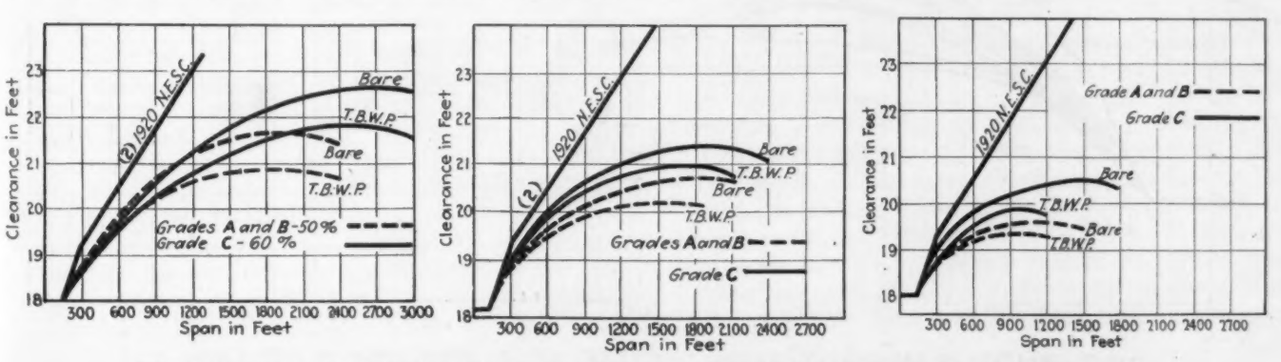


FIG. 1—TYPICAL SPAN LENGTH SHOWING ASSUMED SAG VALUES FOR LOADING

[1]N.E.S. Code, 1920, Rule 220-b-1. Additional clearance according to voltages is specified in Rule 220-d-1.



FIGS. 2, 3 AND 4—RELATION OF CHANGE IN VERTICAL SAG OF AERIAL LINES TO CODE REQUIREMENTS

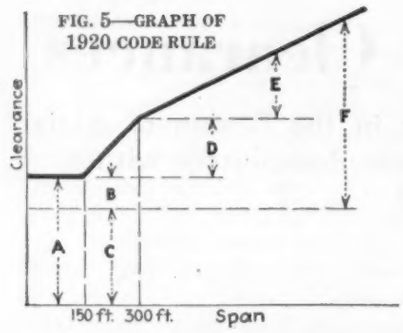


FIG. 5—GRAPH OF 1920 CODE RULE

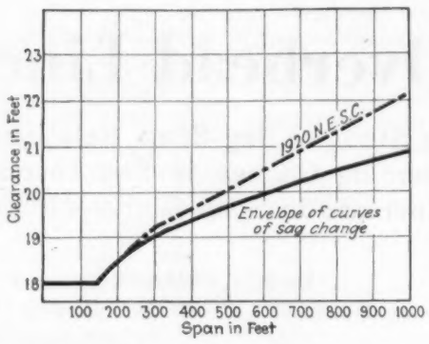


FIG. 6 (AT RIGHT)—CURVES SHOWING ENVELOPE OF CHANGE IN VERTICAL SAG OF LINES WITH VARYING SPANS

curve marked 2 is for spans greater than 300 ft. in length, and its slope indicates the rate of increase.

In order to visualize a comparison of the requirements of the National Electrical Safety Code of 1920 with the changes in sags that occur, calculated curves for No. 0000 copper conductor are shown in Figs. 2, 3 and 4 for the three loading conditions. These curves clearly show the fallacy of assuming that the change in sag increases indefinitely with increase in the length of span, as line conditions change from stringing at 60 deg. F. to the loading or temperature conditions specified. All the curves show the same tendency to approach a maximum value for change of sag at some particular length of span and, instead of increasing for greater spans, to decrease more or less rapidly for longer spans.

Fig. 6 shows all the curves of Figs. 2, 3 and 4, together with the graph of the 1920 code, as shown in Fig. 5. This group of curves is the basis for the envelope shown in Fig. 6.

Fig. 6 shows an approximate maximum envelope of the change in sag with span length. Even where no ice loading exists, as in the light loading curves, the same drooping characteristic is evident. The graph of Rule 220-B1 of the N.E.S. Code of 1920 is shown by the two sloping lines 1 and 2. The vertical distance between the graph of the Safety Code rule and that of the curve for change in sag represents the unnecessary increment of the stringing clearance and a correspondingly unnecessary increase in structure cost, due to the greater heights and strengths of supporting towers or poles. For example, for a 1,500-ft. span an increase of 6.2 ft. is required, as compared with a calculated increase of 1.4 ft. for a bare conductor in heavy loading territory, and the unnecessary difference is practically 5 ft. in tower height. For longer spans this difference will correspondingly increase. Studies of smaller conductors indicate still greater differences from the Safety Code requirements, whereas larger conductors show somewhat less but in all instances serve qualitatively to support the main contention that experienced increases in conductor sag due to load are not continuingly greater as the length of span is increased indefinitely. Therefore, the existing rules should provide maximum increases in sag beyond which the overhead clearance of any span length need not be increased.

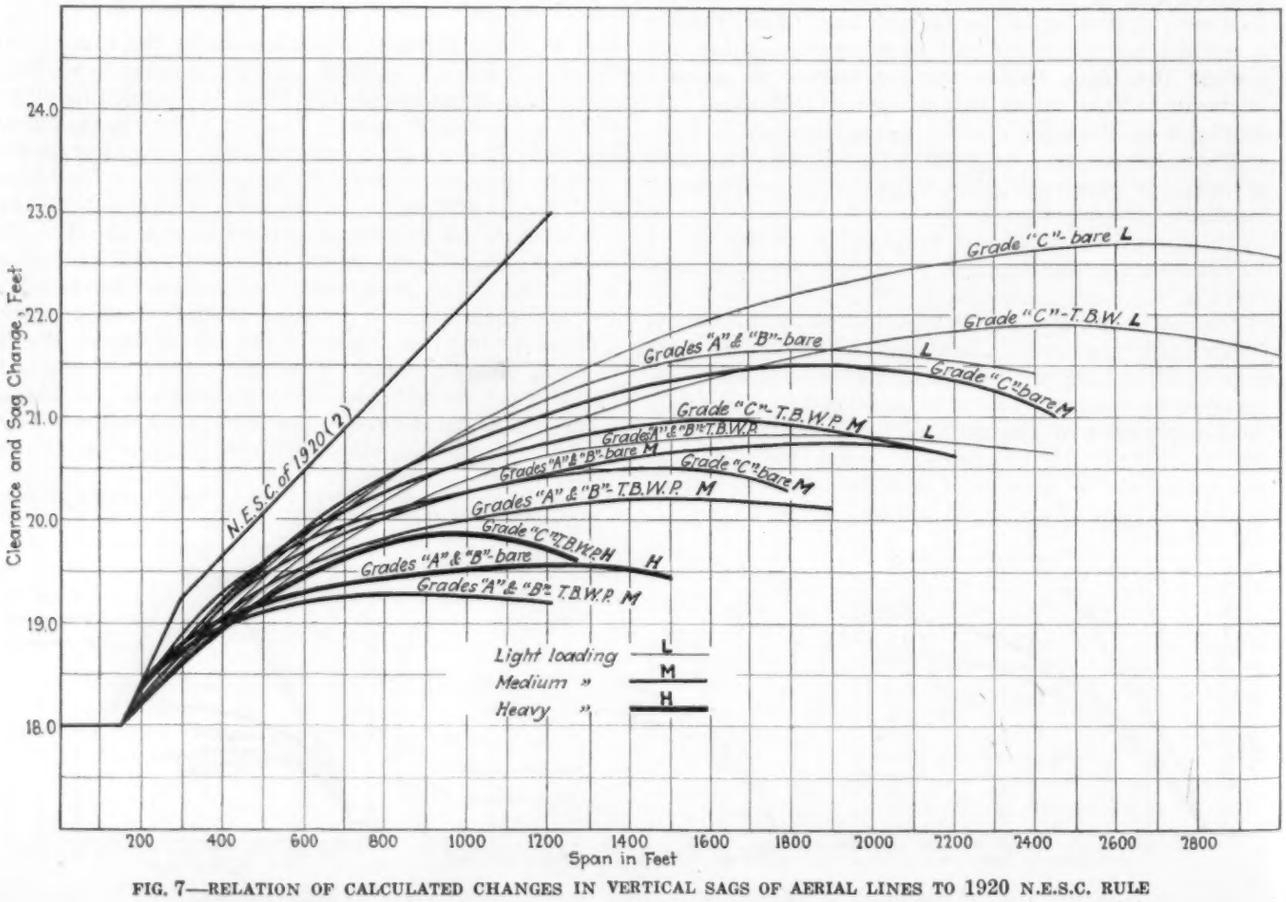


FIG. 7—RELATION OF CALCULATED CHANGES IN VERTICAL SAGS OF AERIAL LINES TO 1920 N.E.S.C. RULE

High-Voltage Field Testing of Cables

Development of Field Equipment—Features of Portable Kenotron Set Which Is 2 Tons Lighter than Usual Portable Equipment—Value and Need of Careful Field Tests

By C. L. KASSON
Superintendent of Standardizing and Testing Department
Edison Electric Illuminating Company of Boston

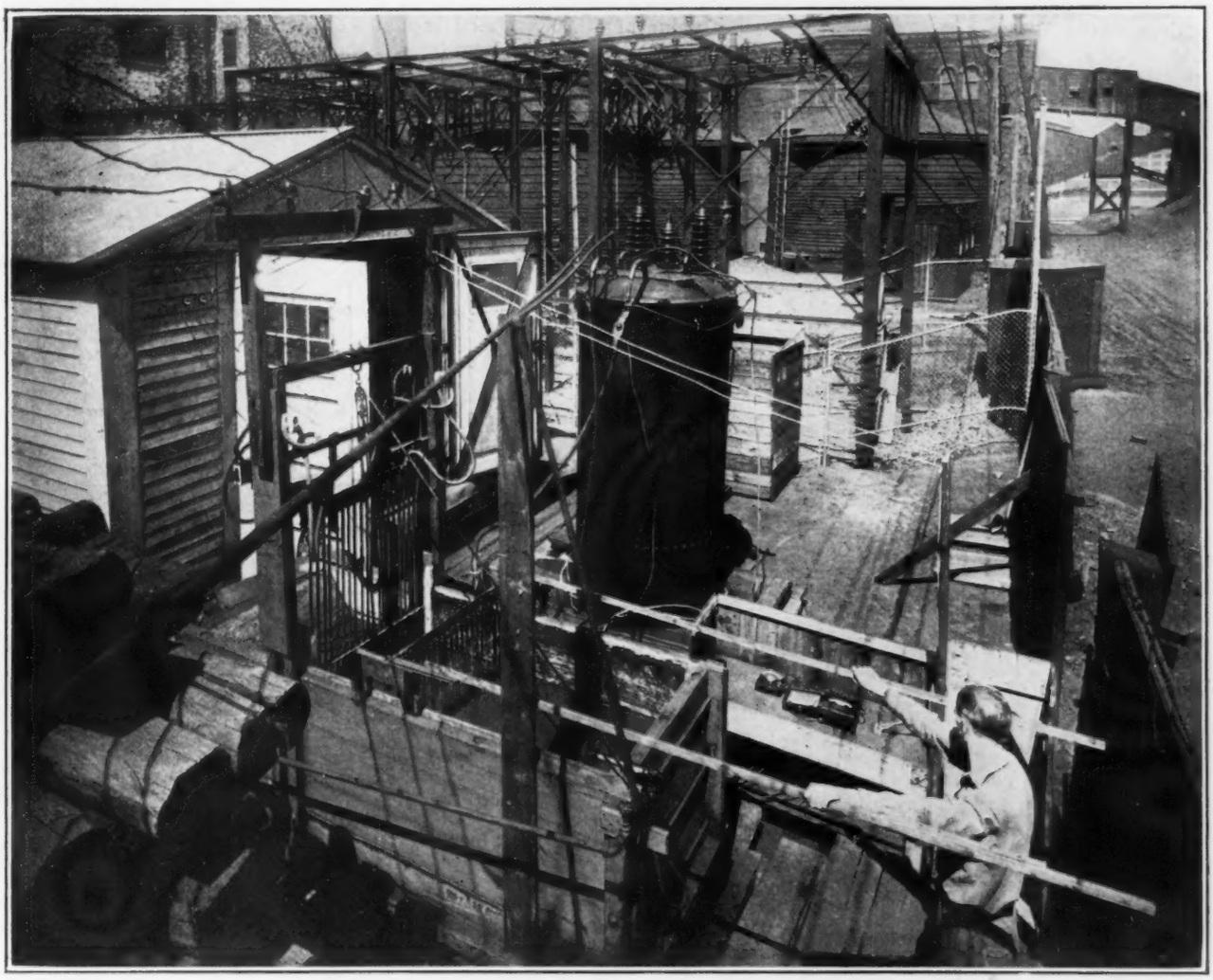


FIG. 1—OUTSIDE VIEW OF 50-KV., 1,000-KVA. ALTERNATING-CURRENT TEST SET-UP

A CABLE failure is usually an insulation failure—a breakdown of an electrical insulating material under electric stress. One fault puts the whole line out of commission and sometimes causes further disturbances due to the shock and surge set up by the short circuit. Because of the importance of such occurrences, engineers are constantly studying the cable situation to make better cables and to reduce the number of failures in service.

When a cable has been installed, it is the general practice to test it with high-voltage alternating or direct current to weed out any weak spots in the cable or joints. This is well worth while, as it is a check in some measure on the care used in installing the cable and on the character of the joint work. The advantages and disadvantages of making these acceptance tests with alternating or direct current will be discussed at a later point in this article.

After a power cable is installed and operating it is quite customary to omit all further high-voltage tests. The cable is, however, operating at unknown temperatures and its insulation is very slowly aging as a whole and perhaps deteriorating in spots. If these spots could be weeded out before failure in service under operating conditions, there would be no cable faults. Obviously this is impossible, but test engineers are

working to eliminate some of these weak spots by predictive testing. Most work of this kind so far has been done by alternating or direct-current high-voltage proof testing and by dielectric loss tests.

High-voltage tests will, as previously stated, weed out weak spots. However, a given test will pick out only those spots that are ready to fail under the given stress applied for the given time. In other words, not all weak spots are eliminated and some spots may be even accelerated toward future failure. It might be argued that if the tests were applied often enough, it would be possible to catch most all the weak spots. This argument is a good one but has not been proved nor disproved.

Practically all engineers are agreed on the value of factory tests, but although cables have been tested in the field with high voltage a.c. for many years, there is some difference of opinion as to the value of field tests. However, the cable may be injured in installing and the sections have to be jointed, so the installed or field acceptance test should be valuable.

In addition to this initial or acceptance test it is thought by some engineers that a system of repeated testing or proof tests will materially assist in predetermining faults and insuring continuity of operation. This proposition is also the subject of discussion and engineers are not agreed as to its value.

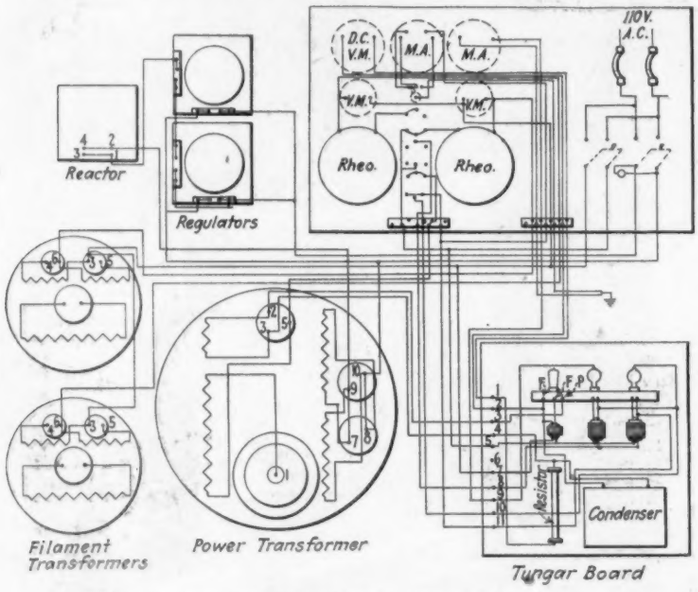


FIG. 2—LOW-TENSION WIRING, 100-KV. PORTABLE KENOTRON SET

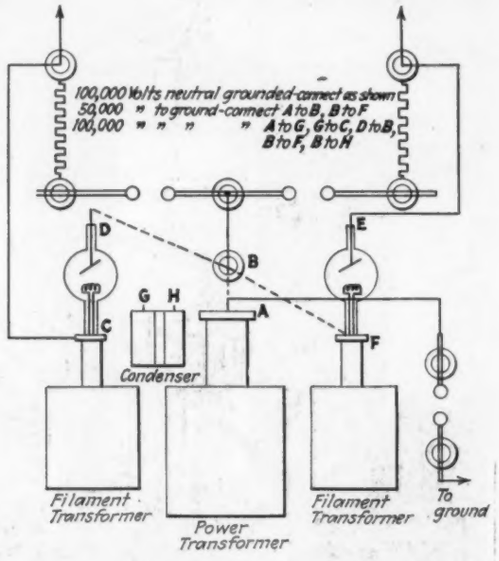


FIG. 3—HIGH-TENSION CONNECTIONS, 100-KV. PORTABLE KENOTRON SET

DEVELOPMENT OF APPARATUS

The standardizing and testing department of the Edison Electric Illuminating Company of Boston has conducted several thousand a.c. tests and more than 1,000 d.c. tests on installed cable. These field high-voltage tests have been made by temporary set-ups, by an a.c. portable 800-kva., 30,000-volt cable-testing set, and during the last few years by d.c. portable kenotron sets.

Temporary set-ups have ranged all the way from those of a few kilovolt-amperes and several thousand volts to that shown in Fig. 1 and Fig. 4, which will test seven miles of 25-kv. cable at 50 kv. This latter outfit involves step-down and step-up transformers of 1,000 kva., together with limiting reactor, water rheostat and all necessary auxiliary control and measuring equipment.

The a.c. portable cable test set shown in Fig. 5a has been previously described in these columns. This set has been in successful and continuous operation since 1912. Its capacity is seven miles of cable at 30 kv.

The first d.c. portable set was put into operation in 1919. It consisted of a General Electric 5-kw., 50-kv. kenotron test set mounted on a small trailer. The general arrangement is shown in Fig. 5b. This set did good work but was of too low voltage and it was superseded by the present set, shown in Figs. 5c and d.

This set is of 10-kw. capacity, maximum voltage 100 kv., and is mounted on a 1-ton Ford truck. The electrical equipment consists of General Electric transformers, regulators and tubes, together with all necessary control, auxiliary and measuring apparatus to make a complete kenotron set. The equipment is in separate units, individually mounted upon the truck as dictated by space and weight considerations. Two kenotron tubes are used and can be arranged so that tests of 50 kv. or 100 kv. can be made from conductor to ground and 100 kv. between conductors with the center points grounded. This outfit has been in regular operation for two years and is used for acceptance and proof tests.

WIRING DETAILS, PORTABLE KENOTRON SET

The wiring diagram of the set is shown in Figs. 2 and 3, with the details as follows:

Two rectifying kenotrons or vacuum tubes are mounted on the highly insulated bushings of two exciting transformers so that when the exciting transformers are made alive, current passes through the filaments of the kenotrons. This current is maintained at the correct value by means of rheostats mounted on the switchboard.

Two voltmeters indicate the voltage across the filaments. The main transformer has one terminal of its high-voltage winding highly insulated. This terminal can be connected by flexible connections to either tube or to both, as called for in the three conditions in Fig. 3.

The other terminal is carried to ground through current-measuring equipment so that any current in the winding must be measured.

The main transformer is made alive through two regulators in parallel so that any voltage from 0 to 75 kv. a.c. can be impressed on the kenotrons. There is also a measuring coil in the transformer which gives 176 volts when the main winding is excited to 75 kv. This 176 volts or whatever other voltage is being produced is impressed on a d.c. voltmeter through a small rectifying tube and series resistance.

A small condenser smooths out the d.c. wave for the voltmeter circuit just as the capacitance of the cable smooths out the d.c. wave by which it is being tested. The voltmeter is calibrated in high-tension volts.

When only one tube is in use, only one exciting transformer is made alive. This is governed by a five-element (only three are used) three-position switch mounted on the switchboard panel. When the "T" connection is not in use and one tube alone or two in series are being used, there is only one d.c. circuit, and a d.c. milliammeter without rectifying valves may be used to measure the current. However, when the "T" connection is used, one tube is passing current in one direction half of the time and the other tube is passing current in the other direction the other half. The result is that with no valves in the circuit the d.c. milliammeter tries to act as an a.c. instrument.

To avoid this trouble, two milliammeters are used on the "T" connection, each with a valve in series but with two valves poled in the opposite direction. The valves consist of two tungar rectifying tubes, each with its own exciting transformer. These are excited only when the "T" connection is used. This again is governed by the three-position switch before mentioned.

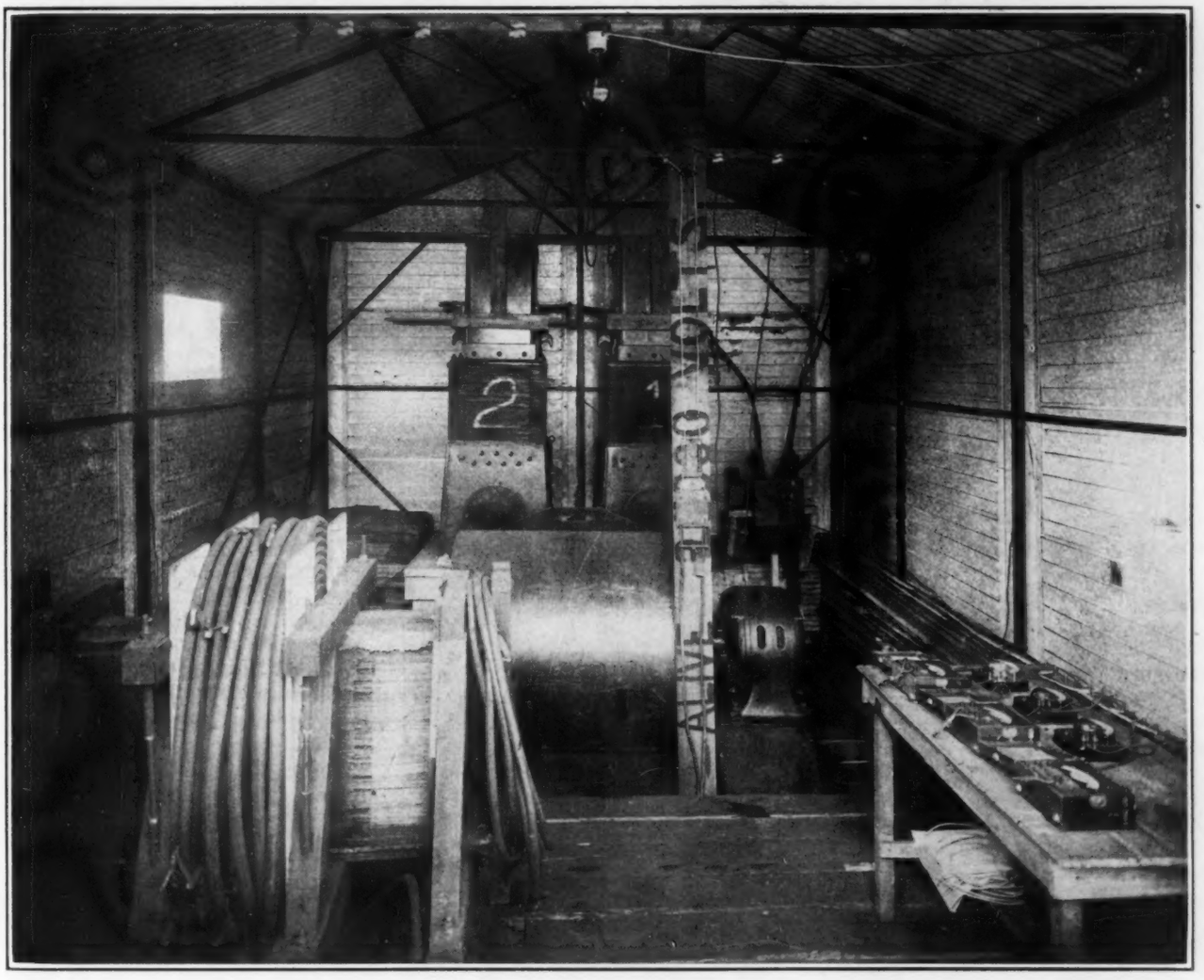


FIG. 4—INSIDE VIEW OF 50-KV., 1,000-KVA. ALTERNATING-CURRENT TEST SET-UP

In order to protect the tubes when heavy overloads are put on them a series reactor is placed in the regulator circuit to drop the transformer voltage at full load nearly to zero. A pilot lamp is connected across the switch that controls the power transformer to call attention to the fact that the outfit is alive.

As shown in Fig. 3, protective spark gaps are connected across each tube and the main transformer, set to arc over at a little more than full voltage. A balancing condenser is provided, which is connected across the tube next the transformer when two tubes are used in series. This keeps the voltage drop across the two tubes at equal value and prevents breakdown of the first tube.

There are also discharge resistors operated by a control handle near the switchboard to prevent the operator of the outfit from shock when changing connections on a recently charged cable.

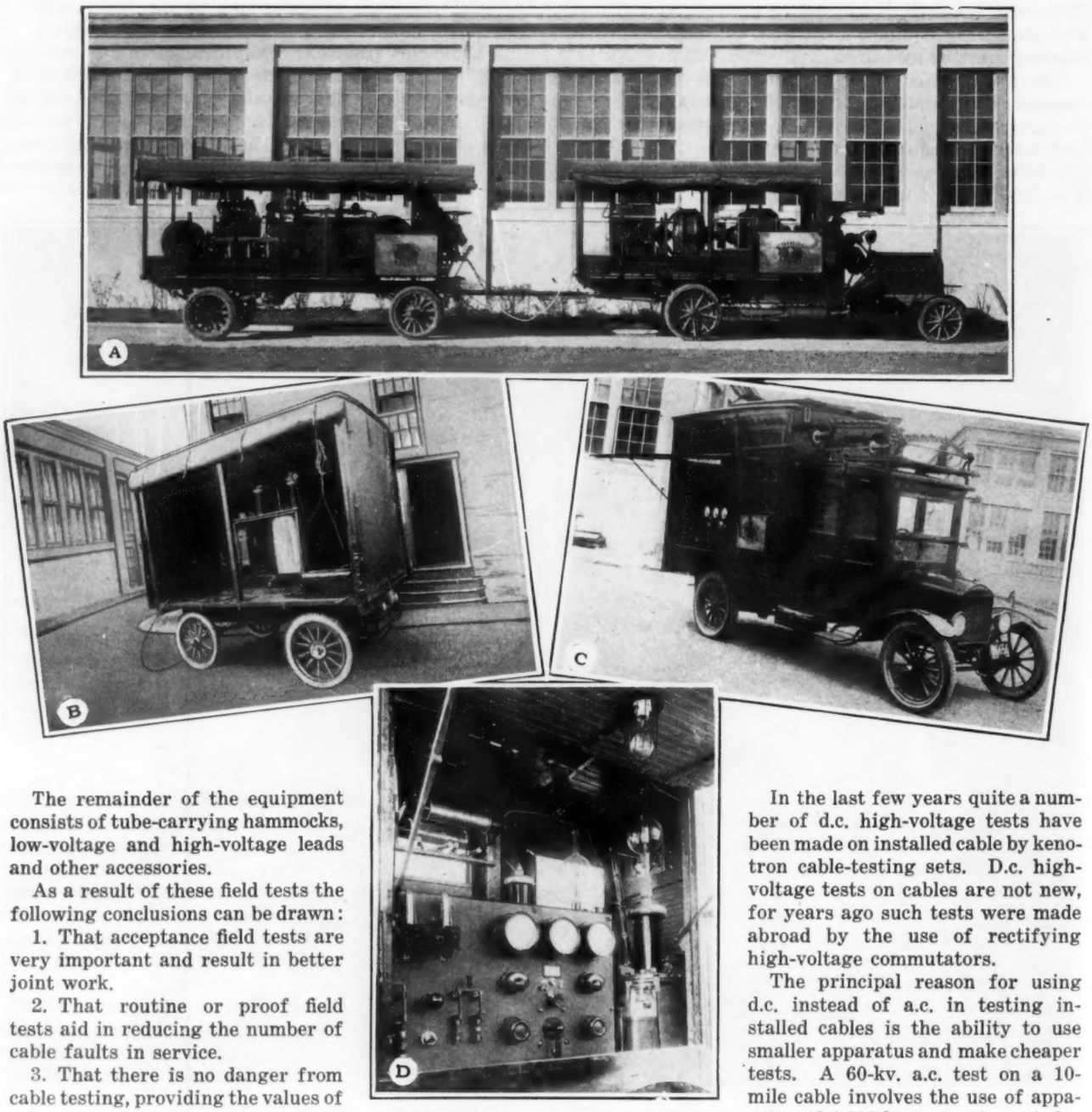


FIG. 5—RELATIVELY LIGHTWEIGHT PORTABLE TEST SET DEVELOPED IN BOSTON
(a) 30-kv., 800-kva. portable a.-c. test set. (b) 50-kv., 5-kw. portable kenotron set. (c) 100-kv., 10-kw. portable kenotron set (outside view). (d) 100-kv., 10-kw. portable kenotron set (inside view).

The remainder of the equipment consists of tube-carrying hammocks, low-voltage and high-voltage leads and other accessories.

As a result of these field tests the following conclusions can be drawn:

1. That acceptance field tests are very important and result in better joint work.

2. That routine or proof field tests aid in reducing the number of cable faults in service.

3. That there is no danger from cable testing, providing the values of voltage applied and the duration of the tests are not excessive.

A cable is, in the broad sense, a problem of insulating material. The breakdown of insulating material under electric stress depends upon many factors; it may take place abruptly or over a long period. It depends upon the stress—that is, the voltage, frequency and wave form—together with the time of application and the ability of the material to radiate the heat generated within it by the electric stress.

The average high-voltage cable test produces abrupt or fairly abrupt breakdowns. Such a test may also accelerate other defective spots toward breakdown. This is to be expected and discounted. Thus in all a.c. cable testing it is necessary to consider very carefully the values of test voltage and time of application for a given cable.

In the last few years quite a number of d.c. high-voltage tests have been made on installed cable by kenotron cable-testing sets. D.c. high-voltage tests on cables are not new, for years ago such tests were made abroad by the use of rectifying high-voltage commutators.

The principal reason for using d.c. instead of a.c. in testing installed cables is the ability to use smaller apparatus and make cheaper tests. A 60-kv. a.c. test on a 10-mile cable involves the use of apparatus of 4,000-kva. capacity. A d.c. test of 140 kv. on the same line can be made with a 10-kw. set. No wonder everyone is talking d.c. tests for cables!

The action of d.c. and a.c. is somewhat different and the reaction of insulating materials to d.c. and a.c. stresses is probably different. In other words, a d.c. test and an a.c. test are not exactly equivalent. Under a d.c. stress the current flow is unidirectional, whereas under an a.c. stress it is alternating. The potential gradients a.c. and d.c. through the insulation are not equal and the relative stresses upon individual layers of the insulation and compound are probably unequal.

In making d.c. cable tests it is becoming customary to use arbitrary factors to determine the d.c. test voltage that is equivalent to a given a.c. test voltage. As a matter of fact we know little about the values of these

factors as yet and caution should be used in applying them. The determination of the factor 2.4 has been made from rupture tests, but relative voltage relations a.c. and d.c. at rupture may not hold at the much lower test voltages.

SHORT-TIME D.C. TESTS BETTER

By all means let us proceed with d.c. testing on cables but be conservative until we know more about the action of insulating materials under high d.c. stresses. Especially is it suggested that long-time d.c. tests be abolished for the present.

The kenotron is going to be one of our valuable testing devices, but it must be used carefully. We must know more about the ripple and its action on the cable insulation, also more about the unbalanced stresses in a multiple tube kenotron under relatively high d.c. leakage currents. Especially, more information must be gathered in regard to surges at breakdown and a time of cable discharge.

All proof testing of installed cables has for its purpose the predetermining of cable faults. Undoubtedly the kenotron will prove very valuable for this work and can be used to break down some of the incipient cable faults. The voltages employed should not be too great and the time of application should be short. If such a test can be supplemented by a dielectric loss test at operating voltage, we shall then be able to get a good line on the reliability of our cables in service.

The kenotron test would apply the extra stress to search out incipient faults, and the dielectric loss test would give a line on the general condition of the insulation at the time of test and under the then existing temperatures. Such tests, coupled with proper temperature determinations, will give us data for studying our cables.

If work of this character is further reinforced with duct temperature surveys and electrolysis surveys, a great deal of light will be thrown on our underground transmission troubles.

In order to obtain the most benefit, the kenotron tests, dielectric loss tests, temperature tests, duct temperature surveys and electrolysis surveys must be done in conjunction and under a unified engineering plan.

Wood as a Fuel for Generating Electric Power

WOOD as a fuel for the production of electric power by public utility power plants is a factor of great importance on the Pacific Northwest, according to a bulletin issued by the Geological Survey. In Oregon during the month of June 18,644,000 kw.-hr. was produced by burning wood, as against only 33,000 kw.-hr. from other fuel sources and 47,857,000 kw.-hr. from water power.

In the State of Washington also wood fuel produced more electric power than all other fuels, the total for wood being 2,581,000 kw.-hr., against 895,000 for all other fuels. Other states in which wood is an important electric power fuel are: Alabama, 90,000 kw.-hr.; Arkansas, 530,000; Florida, 150,000; Georgia, 329,000; Louisiana, 97,000; Minnesota, 494,000; Mississippi, 93,000; South Carolina, 64,000; Wisconsin, 90,000. The figures are for June. All the other states produced 2,369,000 kw.-hr. from wood, making a total for the country of 25,551,000 kw.-hr.

In some of the forest states, notably Washington and Oregon, the showing for wood as a fuel in the production of electric power for private industries would be more impressive, as the lumber mills and other forest industries in those states frequently provide their own electric power from the combustion of sawdust, slabs and other waste.

Letters from Our Readers

Utility Printing Department Pays Way in Georgia

To the Editor of the ELECTRICAL WORLD:

In the issue of the ELECTRICAL WORLD for Oct. 9, I notice an article on page 762 which states that the printing department of the Consolidated Gas, Electric Light & Power Company of Baltimore is believed to be the only undertaking of its kind within the utility industry. I wish, therefore, to furnish you with an account of the printing department of the Georgia Railway & Power Company of Atlanta.

Starting in the year 1913, consisting of a supply room with a multigraph machine, this plant has grown and expanded until at the present time it occupies floor space of approximately 6,000 sq.ft. It contains three cylinder and five other presses, besides a proof press, a cutting machine and a folder. The equipment is capitalized at $27,691, not including the value of type which is kept standing and foundry type, which is estimated at $12,000. There are approximately 3,000 stock forms in use in the company, all of which are stored by the stationery department, which is a subsidiary of the printing department, for issue on departmental requisition.

The total cost of the company's printing in its own print shop during 1925 amounted to $63,703, which covers supplies, paper, inks, rollers, rental on building space for the shop and miscellaneous overhead charges. If this same work had been done by commercial printers it would have cost the company $82,653. The following statement shows net savings to the company from the operation of the printing department during the year 1925:

January	$2,209.25	July	$1,172.32
February	1,254.37	August	1,519.44
March	1,526.41	September	1,700.96
April	1,274.86	October	1,806.31
May	1,218.77	November	1,750.65
June	1,397.39	December	2,118.89
Total			$18,949.62

The above statement issued at the close of the year 1925 shows conclusively that the printing department of the company is in itself paying the company well for its maintenance and operation. It took care of practically all of the printing requirements of the company in 1925 and has just recently added an automatic press to its complement. This addition will, no doubt, increase the output enough to take care of the increase in printing requirements caused by the recent merger of the Georgia Railway & Power Company, the Southern Power Company, the Mutual Light & Water Company and the Georgia Utilities Company. It is thought also that a type-casting machine, another cylinder press and another folder will be added at an early date.

L. K. STARR,
Manager Public Relations Department.
Georgia Railway & Power Company,
Atlanta, Ga.

Central Station and Industrial Practice

Estimated Cost of 10,000-Hp. Hydro Development

AN AUTOMATIC hydro-electric development of 10,000-hp. capacity is now under construction at Sherman Bridge (in the town of Monroe Bridge, Mass.) by the New England Power Company, the plant being about two and a half miles below the well-known Davis Bridge station of this company on the Deerfield River. To July 1, 1926, the company had expended $1,298,348 on this development and estimated that $838,012 would be required for its completion. In connection with a petition for the right to issue stock for this and other work, the company filed the accompanying tabulation of itemized estimated final cost for Sherman Bridge with the Massachusetts Department of Public Utilities.

The Sherman Bridge development will increase the output of the present Deerfield River plants of the company by 25,000,000 kw.-hr. net per year, the present output of these plants being 280,000,000 kw.-hr. The capacity of the present plants is 88,000 kw., and the final capacity of the complete Deerfield River project is 135,000 kw. At Sherman there will be a new pond with an area of 230 acres and a mean operating head of 78 ft. The pondage will extend back two and one-half miles to the Davis Bridge plant tailrace, and the development will require the relocation of two miles of railroad and two miles of highway.

ESTIMATED COST OF SHERMAN BRIDGE DEVELOPMENT, NEW ENGLAND POWER COMPANY

Local general expense	$143,660
Construction plant	71,000
Preliminary expenses	180,925
Dam	259,120
Bypass conduit	73,120
Spillway	155,500
Intake	45,400
Penstock	20,020
Power house structure	89,300
Hydraulic equipment	40,000
Electrical equipment	209,900
Testing and starting	3,000
Sub-total	$1,290,945
Contractor, 10 per cent	129 094
Sub-total	$1,420,039
Engineering, 5 per cent	71,001
Lands, flowage properties, etc	589,000
Interest during construction at 6 per cent per annum	56,320
Estimated total cost	$2,136,360
Per horsepower	213.64

Water will be impounded by an earth-fill dam 100 ft. high above the original river bed, the maximum width of the dam upstream and downstream being about 550 ft. The dam will be 700 ft. long on top and will contain 300,000 cu.yd. of earth fill.

During the construction period the river flow is being handled by a bypass, extending along the west bank of the river under the earth fill. The bypass is horseshoe in shape with a cross-sectional area of 140 sq.ft. Approach walls extend upstream and downstream from the ends of the inclosed conduit. Upon completion of the dam the upper end of the bypass conduit will be plugged with steel and concrete beams and will be backfilled with earth.

The spillway is of the straight overflow type, 160 ft. long, and is located on a ledge on the right-hand side of the river. Water flowing over this will be conducted back to the river below the dam through a channel 50 ft. wide excavated in solid ledge. The intake to the penstock will be on the left bank of the river, with the invert 36 ft. below the top of the earth dam and 20 ft. below the fixed spillway crest. From the intake structure a reinforced concrete conduit 14 ft. in diameter leads the water through the embankment section, joining a 13-ft. steel penstock about 200 ft. long.

The power house, 45x58 ft. in plan, has a concrete and brick-steel superstructure. The installation includes a single 10,000-hp. turbine and a 9,000-kva. generator. Transformers stepping the generated voltage up to 110,000 with the high-voltage bus are outside the power house.

Rubber-Insulated Cable Under 840 Ft. of Water

BY M. T. CRAWFORD
Superintendent of Distribution
Puget Sound Power & Light Company, Seattle, Wash.

BECAUSE of the great depth of water encountered in laying a 15,000-volt cable across the main ship channel of Puget Sound from Richmond Beach to President's Point, Wash., the installation presented a number of interesting problems to engineers of the Puget Sound Power & Light Company. The distance is approximately four miles and the water reaches a maximum depth of about 840 ft. At this depth the hydrostatic pressure is approximately 373 lb. per square inch.

No record was found where a high-voltage rubber-insulated submarine cable installation had ever been made at a water depth exceeding about one-fourth the value encountered at this crossing. Because of the possibility of the cable being damaged or severed under water during operation it was decided that rubber insulation would be the most durable. In many years of experience with other cable crossings it had been found that cambric or paper-insulated cables were irreparably damaged whenever the lead sheath was broken and salt water entered, unless the depth of water was very moderate. Rubber cables, however, have been operated for many years with and without lead sheath, and repairs have easily and successfully been made following cases of severing of cable by anchors, etc. Inasmuch as the lead sheath offered little protection and considerably increased the weight and size of the cable it was omitted.

On account of the hydrostatic pressure encountered at this depth of water (approximately 373 lb. per square inch) an investigation was made regarding the hydroscopic properties of rubber. The Bureau of Standards had conducted a number of experiments, the results of which have since been published in Technological Paper 299, which indicated that vulcanized rubber would absorb pure water in continuously increasing amounts when subjected to high hydrostatic pressure. It was found, however, that in the case of salt water the rubber would take up a small percentage of water in the

space of a month, after which no further absorption took place.

Before drawing up specifications for the cable, manufacturing conditions at American factories and the results of operating experience with other cable installations were carefully scrutinized. The specifications called for a three-conductor, 250,000-circ.mil stranded copper cable, insulated with a wall of $\frac{13}{32}$-in., 30 per cent vulcanized rubber covered with a rubber-filled tape. The three conductors so insulated were laid up with a saturated jute filler to make a round cable, which was wrapped with rubber-filled tape. The cable was then wrapped with two layers of impregnated jute and covered with a spirally wound armor made up of No. 4 B.W.G. galvanized medium soft steel wire. No outer serving of jute was applied over the armor. The completed cable is 4 in. outside diameter and weighs 15¼ lb. per lineal foot. The cable was given a test, following 24 hours' immersion in water, of 35,000 volts to ground for one minute, followed by 26,400 volts to ground for five minutes.

To avoid the possibility of corona cutting the rubber insulation on the shore ends out of the water, each insulated conductor on this portion of the cables was wrapped with tinned copper tape 0.005 in. in thickness, 1 in. wide, with an overlap of ¼ in. The cable was manufactured by the Okonite Company at Passaic, N. J., in maximum lengths of 2,700 ft., each coiled in an open gondola car, the total shipment consisting of eighteen carloads. The cable was unloaded on a large dock in Seattle harbor, where it was spliced up into two lengths suitable for laying.

The making of thoroughly dependable splices under the severe conditions encountered presented both mechanical and electrical problems. After considerable research work and experience a splice was developed that will withstand a test of 40,000 volts and a nineteen-ton tensile stress. Ability to withstand heavy tension was necessary due to the weight of nearly 1,000 ft. of cable hanging overboard while laying in the deep portion of the channel. The actual net laying tension after deducting for the buoyancy from water displacement reached values up to 10,000 lb. In the event of the cable being raised for repairs, still greater tensions can be had.

In making up the splices the copper conductors were joined by dovetailing strands and sweating together and wiping up into a smooth job equal in tensile strength to the conductor. Pure gum rubber tape was applied to a thickness 50 per cent greater than the original insulation after penciling back the insulation to a distance of 18 in. from the center of the splice. This was covered with six layers of Excelcite tape and then with six layers of wet linen tape. The three-conductor splices were then vulcanized in a beeswax bath at 150 deg. C. for one hour. After slowly cooling, the splices were examined by means of X-ray for possible voids or decentralization and then bound up with jute filler and armored.

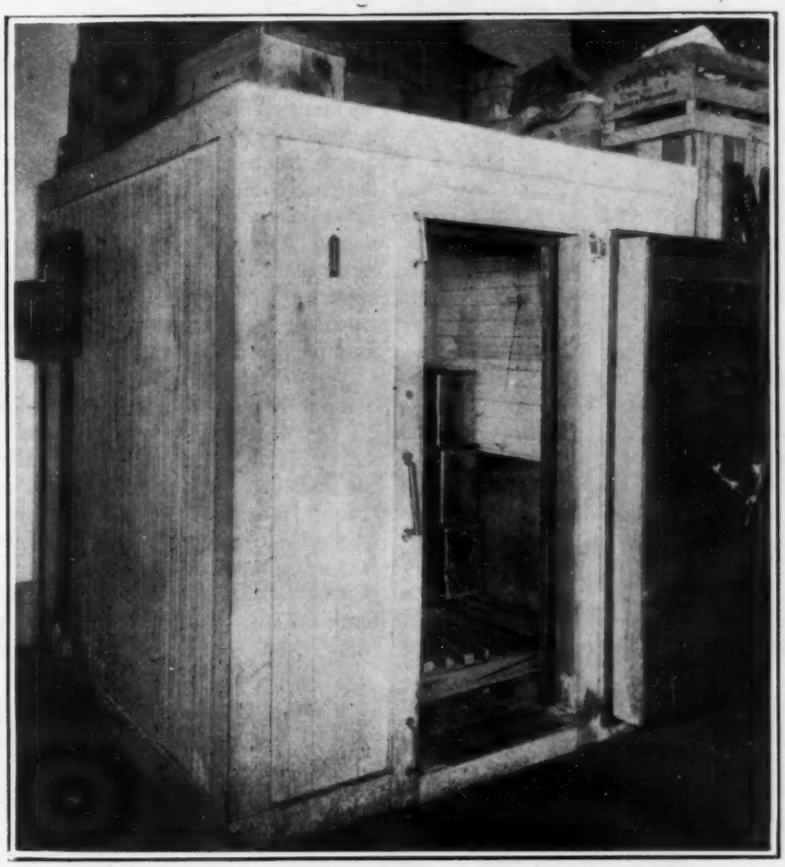
Each length of cable from the factory was supplied with 20 ft. of extra armor on one end laid up over a dummy core. This extra armor was laid over and past the splice at original pitch and on top of the armor of the length not provided with a dummy core. The overlaid length of armor was then served down very tight with two wrappings of No. 9 B.W.G. galvanized wire soldered at intervals and wiped smooth. The completed splice thus made has a diameter of about 5½ in. and a total length of about 25 ft.

Constant Electric Heat for Refining Honey

ELECTRIC heat received a new application recently when Martens, Read & Company of San Francisco, bottlers and distributors of honey, found it necessary to adopt a different method of heating the compartment in which strained honey is refined.

The compartment has dimensions of approximately 7x7x7 ft. with 6 in. of insulation consisting of about 4 in. of cork with a tongue-and-groove lining 1 in. thick on the inside and outside. A loading consists of about 225 5-gal. tins of honey in a plastic state. When placed in the compartment the honey is so thick that it is practically solid and has a white appearance. After being left in the compartment for two days and two nights at a temperature of 150 deg. the honey is clear in appearance and entirely liquid. Formerly the work was done by heating a water trough with gas burners and then placing the tins of honey in the trough.

Recently electric heating has been adopted to this purpose by mounting the heating units around the bottom of the compartment. The tempera-



VIEW OF COMPARTMENT USED IN HEAT PROCESSING OF HONEY

ture is controlled by a thermostatic, magnetic type of switch.

The advantages of the electric method of heating as compared with the superseded method include the elimination of fire hazard, the reduction of time necessary for processing the honey and the improved results obtained. A saving in labor has also been realized, and rusting of the tins is eliminated. With the close temperature control it is not possible to overheat the honey, which would darken it and spoil its flavor.

Increase Rating 13½ Per Cent with Static Condensers

BY GEZA E. ORLEY
Superintendent Electrical Department
New York & Honduras Rosario Mining Company

ALL POWER is produced by water and there is always a water shortage during the dry season, which extends over about four months. Due to the more extensive operation of the mine and consequently increased demand for power the New York & Honduras Rosario Mining Company faced the situation where the only thing that could be done to secure the needed energy was to increase the power factor. The high cost of transportation and other economic considerations make it unprofitable to take into consideration a steam or oil auxiliary plant.

The maximum demand that has to be met in the rainy season is the total generated load of the two generating stations at San Juancito and at Guadalupe, which have a combined capacity of 1,400 kw. at approximately 90 per cent lagging power factor. This gives a useful load of 1,550 kva. and a corresponding lagging component of 1,050 kva.

To bring the power factor up to 95 per cent two 150-kva. static condensers have been installed, directly connected to the 6,600-volt line. They consist of a 4,000-volt unit connected in star, with the neutrals connected to a special double neutral trip circuit.

The 2,200-volt condensers are connected to the low-voltage side of the stepping-down transformers. By doing this the power factor of the transformers as well as the power factor of the rest of the line is improved. The two banks of transformers at Rosario substation carry a load of 750 kva. at 80 per cent power factor, which gives them a lagging component of 450 kva. The 150-kva. static condensers reduce the useful load from 750 kva. to 625 kva., thereby increasing their useful capacity by 125 kva. and making it possible to place additional motor load on the transformers.

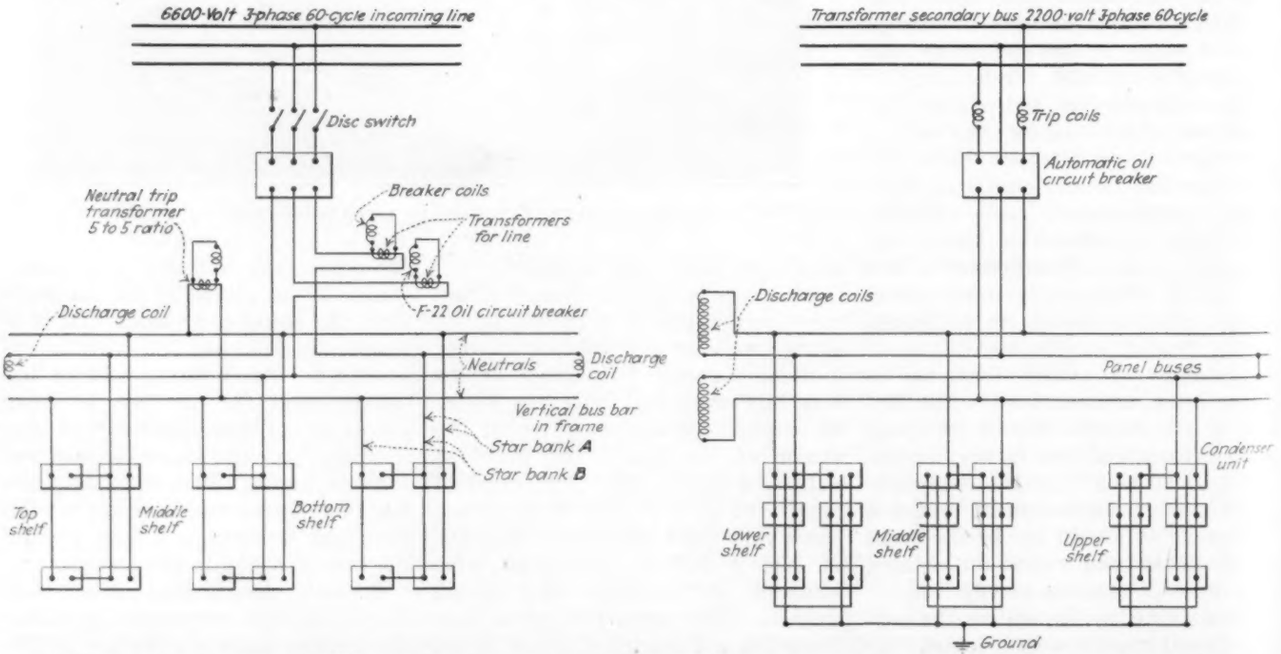
The installation of the static condensers raised the power factor from 80 per cent to 95 per cent and resulted in two improvements: First, the capacity of the generators and transformers was increased by an appreciable amount. The power-factor correcting capacity of the generator does not call for any added load on the waterwheels. At the same time the extra load capacity of the generator is available for future use in case of additional waterwheel capacity. Second, by eliminating the wattless current in the system, the losses in the generator, transformers and transmission lines are practically eliminated.

The two Westinghouse generators at the San Juancito power plant have delivered 880 kw. at 80 per cent power factor. At 95 per cent power factor they are capable of delivering 1,000 kw. This represents a gain of 120 kw.

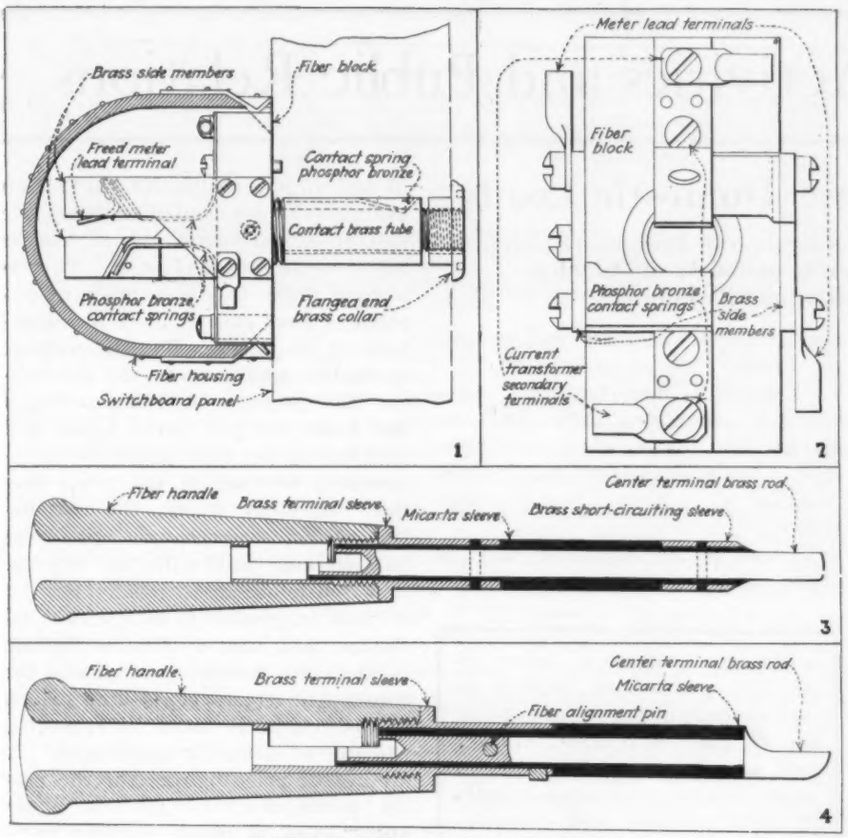
Meter-Testing Jack

A METER-TESTING jack, which has been devised and patented in the organization of the Detroit Edison Company, is now used on all station integrating meters in the company system. Two are required for a meter, one on each current coil circuit.

By reference to the illustration it is seen that the jack consists of a brass tube passing through the switchboard panel and supporting a fiber block at the back. On this block are mounted side pieces of brass, which carry small contact brackets normally in firm contact with two phosphor-bronze leaf springs, mounted vertically on the fiber block and serving as current transformer secondary terminals. The current-coil meter leads are brought to the two brass side pieces. The normal flow of current is from the line lead of the transformer secondary, through one of the bronze



CONDENSER CONNECTED TO 6,600-VOLT INDUSTRIAL LINES MAKE 1,000 KW. AVAILABLE WHERE ONLY 880 KW. WAS BEFORE



METER-TESTING JACK AND PLUGS.

(1) Side and phantom view of jack installed; (2) back view of jacks; (3) section through short-circuiting plug; (4) section through series plug.

springs, across the contact to one side member, to the line side of the meter, out of the meter to the outer side piece, across the contact to the second spring and back to the transformer.

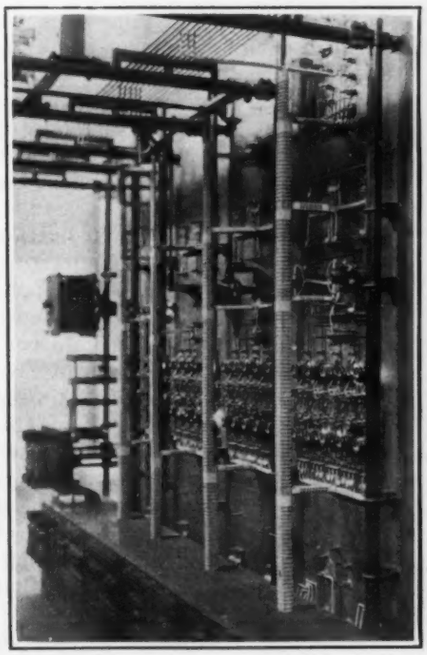
There are two testing plugs. One short circuits the current transformer, clears it from the meter circuit and brings the meter leads out for testing on artificial load. The other plug permits connecting the testing instruments in series with the operating load on the meter.

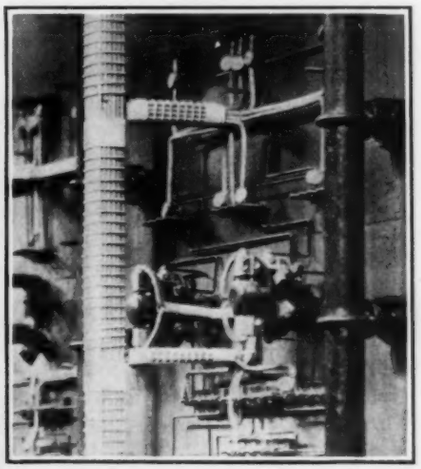
The short-circuiting plug performs its function when it is inserted in the jack by separating the bronze springs from their contact brackets and connecting the springs together through the short-circuiting sleeve just back of the plug tip. The tip, which is the end of the center terminal rod, makes contact with an auxiliary bracket on one of the side pieces of the jack. The other side piece is in connection with the sleeve of the jack through a screw passing through the fiber block. This sleeve makes contact by means of a leaf spring with the rear terminal sleeve on the plug. Leads connected to the center rod and the rear sleeve and brought out through the handle of the plug are thus connected directly to the meter load coil and are clear of the current transformer secondary circuit. The meter may then be tested with current from an outside source.

The series plug has no short-circuiting sleeve and has an offset instead of a centered tip. This plug is shorter than the other and does not reach to the auxiliary contact bracket mentioned above. The proper position of the plug in the jack is assured by an alignment pin moving along a channel cut on the inside of the tube of the jack. When the plug is pushed into the jack, the offset tip breaks only one of the two contacts between the bronze springs and the contact brackets on the side pieces by raising one of the springs. The sleeve on the plug connects through the tube of the jack, through the screw in the fiber block to the side piece carrying the contact bracket from which the spring was separated. Leads from the plug connected to testing instruments thus complete a circuit through the sleeve and center rod of the plug, in which circuit the testing instruments are connected in series with the meter and the current transformer secondary.

The uses of this jack and these plugs are not limited to meter testing alone. The insertion of the short-circuiting plug permits changing the meter without danger of open circuiting transformer secondaries. The series plug may be used for the temporary installation of recording instruments, power factor indicators, etc., which may not be included in the normal metering set-up and which are necessary for the study of operating conditions.

Switchboard Wiring at Mitchell Dam





THE method of wiring switchboards used in the Mitchell Dam hydroelectric plant of the Alabama Power Company is shown herewith. This method, known as cable wiring, gives an unusually neat appearance, as seen. The switchboards at the Lock 12 station are also wired in this manner.

Commercial Activities and Public Relations

Points Way to Greater Domestic Loads

Insull Contends That Lack of Standardization of Domestic Appliances and Limitations That Hamper Installation of Adequate House Wiring Are Curtailing Possibilities

THE extent to which individuals of a community may be personally interested in promoting electrical development and the stimulus of adding their personal interest to co-ordinated organization efforts were strikingly emphasized by figures presented by Samuel Insull in a speech before the Electric Association of Chicago last week. Particular stress was laid on the business available to the electrical industry if domestic appliances were more standardized and adequate house wiring were more generally available.

Referring to the Chicago district, Mr. Insull pointed out that the electric service companies, electrical manufacturers, and transportation and communication companies operating entirely on purchased power have a cash investment of more than $1,000,000,000 devoted exclusively to equipment for the production or utilization of electricity or production of electrical equipment. (This figure does not include the Illinois Central electrifications or the many industrial concerns using power.)

These enterprises employ upward of 150,000 men and women, so that, assuming only three dependents per employee, there is an electrical population of at least 450,000.

Just three of the electric service companies and the electrical manufacturers are responsible for 5,500,000 tons of freight shipments in and out of Chicago per year—or the equipment of 1,200 solid miles of freight trains, the freight charges on which were $19,000,000.

The gross income of the combined electrical industry in the Chicago district was nearly $500,000,000 last year, all of which was handled through the local banks. Part was paid out through these banks in wages, part in bond interest and dividends and part in material, equipment, supplies, freight, etc. The individual incomes were again circulated through the "butcher, baker and candlestick maker." This same electrical industry provided a market for $137,500,000 in new capital during 1926 up to June 30.

"Electrical manufacturers have not half completed their job," declared Mr. Insull, since less than half of the primary stationary power installed in the United States is electrified.

"There is an appalling lack of standardization in the manufacture of apparatus and appliances. An official of one of the larger manufacturers says that his company has designs for 22,000 different industrial motors. Yet last year one-half of all orders received were special, each one requiring some change from the standard machine.

> "In my judgment, labor as well as contractors, dealers as well as manufacturers, are standing in their own light. Lower cost of wiring would result in more wiring, and consequently in more material sold, more labor employed, more fixtures and appliances bought and used. Instead of a decrease in the volume of business, expressed in dollars and decreased profit, as some may fear, there would be greatly increased volume and increased annual profit, and increased number of employees and greater continuity of employment."
>
> SAMUEL INSULL.

"But the lack of standardization in connection with the manufacture of domestic and other small appliances, and the inadequacy of house wiring are of most immediate concern. Since 1916 the number of electrically wired homes in the United States has increased 190 per cent, the number of electric customers has increased 173 per cent, electrical output in kilowatt-hours has increased 180 per cent; but the number of electrically operated domestic appliances in use has increased in that time only 100 per cent.

"A canvass of 33 heads of families in one of our companies showed an average of nine and a half electric appliances per home. Some had as many as twenty and over. This is a good index to the number of appliances that can be used to advantage in the home. But the number of electric appliances in use throughout the country in 1925 averaged less than two per wired home, and this was 33 per cent below the corresponding average of ten years earlier. In other words, the installation of domestic electric appliances has not kept pace with the increase in wired homes.

"It is impossible to escape the conclusion that lack of standardization in appliance manufacturing, and the consequent effect upon selling prices, has been a large factor in retarding the use of domestic appliances. In studies of price figures for the past six years domestic electric appliances show a much slighter price trend downward from the war peak than other items of general purchase. Perhaps there are too many manufacturers of this class of goods. There are 178 manufacturers of washing machines, 146 of cooking utensils, 103 of electric irons, more than 100 of refrigerators, and so on. Altogether there are 1,900 different companies in the country manufacturing small electrical appliances and apparatus. The automobile industry may offer a suggestion of what is needed. Quantity production in that industry seems to have been fairly well accomplished by standardization and by centralization of plants, with lower prices to the public and reasonable profits to the manufacturer.

"The house-wiring situation is no better than the domestic appliance situation. In some aspects it is worse, because the bad effects of it are harder to cure. When a building is inadequately wired, adequate wiring is indefinitely postponed and appliance sales are lost. While 15,000,000 homes in the United States are wired for electricity, millions of them lack adequate outlets for either light or appliances. The high cost of wiring is much to blame.

"Over a period of years, the cost of wiring has tended to increase. Installation of domestic appliances

Tying Utility Service with Civic Advantages

THE various Port Huron (Mich.) business associations boast that one of the city's most important industrial assets is Detroit Edison service, this sign along the main highway into Port Huron calling the motorist's attention to the plant (left background) a short distance ahead.

is correspondingly discouraged, as one bad effect leads to another. High cost tends to make the initial wiring inadequate and restrains additional wiring until long after the householder wants, and is ready, to buy more lighting fixtures and appliances.

"In my judgment, labor as well as contractors, dealers as well as manufacturers, are standing in their own light. Lower cost of wiring would result in more wiring, and consequently in more material sold, more labor employed, more fixtures and appliances bought and used. Instead of a decrease in the volume of business, expressed in dollars and decreased profit, as some may fear, there would be greatly increased volume and increased annual profit, an increased number of employees and greater continuity of employment.

"The shortest road to large-volume sales and steady profits is by way of standardization, massed production and low costs. There are four and a half million homes in this territory [Chicago district] not yet wired at all. Of the seven million homes that are classed as wired, a majority are not adequately wired, and the vast majority lack even moderate appliance equipment. Application of the above program to this situation runs into staggering figures: Nearly a billion dollars for wiring and fixtures, more than six billion dollars for lamps and appliances, nearly three-quarters of a billion for additional central-station investment to supply the additional electrical energy required—a total of eight billion of new business.

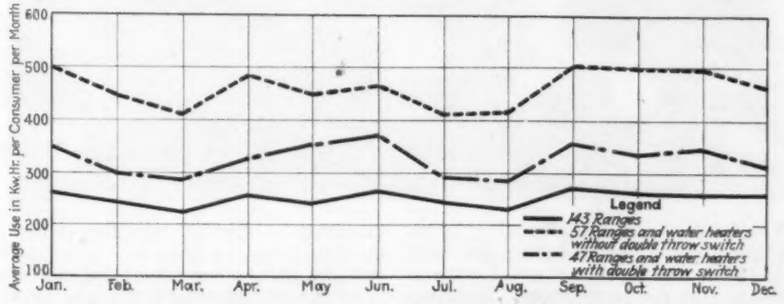
"Staggering as the figures are, they are, nevertheless, an accurate index to the potential market. These eleven or twelve million of homes are going to have electric service, with all of its comforts and conveniences and labor-saving advantages. They will not wait indefinitely for it.

"The Chicago Electric Association offers the means of dealing with the situations which I have touched upon. Study of mutual problems, comparison of methods and sincere associative co-operation for any kind of betterment are bound to bring results. The results will be larger production, lower costs, lower selling prices, assured profits or improved operating conditions—whatever the objective may be. I have found it so in the central-station business. You will find it so in your respective businesses if you give it a fair trial."

Double-Throw Switch Not Favored for Water Heater

CHECKS of kilowatt-hour consumption on a number of range and water-heater installations in rural territory on the lines of the Western States Gas & Electric Company, Stockton, Cal., reveal that where the water heater is not on a double-throw switch the customer's monthly consumption averages about 125 kw.-hr. more than otherwise. The water heaters are thermostatically controlled and range in capacity from 3 kw. to 5 kw. In the case of this company, as generally with California utilities, it is optional with the customer whether the water heater is operated from a double-throw switch or independent of the range.

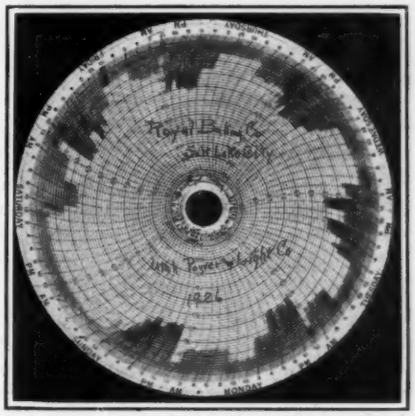
Based upon this record, it is the opinion of the commercial manager of the Western States Gas & Electric Company that the additional annual consumption of approximately 1,500 kw.-hr. justifies the added demand occasioned by the operation of water heaters independent of electric ranges.



RANGE AND WATER-HEATER CONSUMPTION WITH AND WITHOUT DOUBLE-THROW SWITCHES COMPARED

Electric Boiler for Bakeries and Pressing

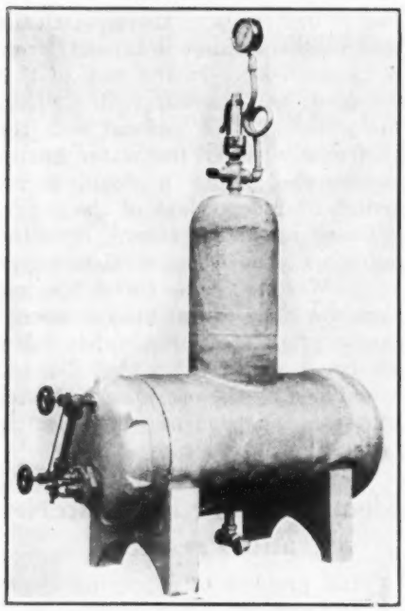
THE problem of supplying steam to form the crust on hard rolls and French bread in bakeries using commercial electric bake ovens has been solved by the Utah Power & Light Company with a small electric steam boiler that was designed by the company and is built locally. One of these boilers is shown herewith. It consists of a piece of 8-in. steel pipe with a T-fitting in the center and a vertical extension to form a steam dome. Each end of the main boiler and the upper end of the steam dome are capped. The whole is covered with heat insulation to conserve energy. For a 60-loaf oven a boiler of 2-gal. capacity is used, equipped with a 5-kw. hairpin heating element,



KILOWATT DEMAND OF A 5-KW. STEAM BOILER IN A COMMERCIAL BAKERY

Multiply reading on chart by 0.96 to obtain demand in kilowatts. Note the relatively high load factor of this type of load.

water gage, safety valve, pressure gage and thermostatic control. Approximately one-third of the demand of the steam boiler comes on the oven peak, and the consumption is such that the average bill is approximately $9 per month at 2.7 cents per kilowatt-hour.



ELECTRIC BOILER SUPPLIES STEAM FOR BAKERIES AND PRESSING ESTABLISHMENTS

A number of such boilers have been sold to cleaning and pressing establishments, the only difference being that a heating element of approximately 15-kw. capacity is required on account of the greater steam consumption. At 2 cents per kilowatt-hour the average monthly bill is approximately $27, which with the collateral advantages of better air, less fire hazard, etc., competes favorably with gas at 50 cents per 1,000 cu.ft. About 40 minutes is required to raise steam from a cold boiler. In the case of this boiler, as well as that used for bakeries, water is injected by a hand pump through a pressure reducer. First cost ranges from $75 to $125.

There is an electric steam boiler installation of this type in a hospital, and other uses will undoubtedly develop

Utility Sells Refrigerators Valued at $4,276 per Day

ONE of the most successful campaigns for the sale of electric refrigerators ever conducted in the South has just been completed by the sales department of the Georgia Railway & Power Company. During the six weeks that the campaign was in progress sales amounted to $154,353, or approximately $4,276 per working day. The result exceeded the rather ambitious quota of $150,000 by $4,353.

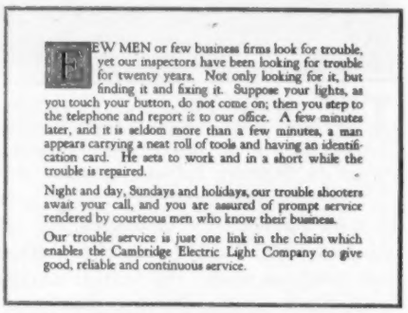
At the opening of the campaign President Preston S. Arkwright warned the salesmen not to make any claims for the machines that could not be filled to the last detail, and to sell the machines strictly on their own merits. To prove his faith in the electric refrigerator Mr. Arkwright was one of the first purchasers when the campaign opened. Despite an average cost of $500 per machine, an average of eight refrigerators was sold per day.

One feature of the campaign was the assurance given customers of proper service to all electric refrigerators sold by the company, the promise being made that a service man would call as regularly as the meter reader, and more often if needed. This assurance was a big factor in the success of the campaign.

Next year the sales department will probably set a quota of $200,000 to be reached in its electric refrigerator sales campaign.

Introducing the "Trouble Shooter" to Public

"TROUBLE shooting" by central stations is a function as old as the industry itself, but like many other utility services, it is often overlooked in publicity material. The Cambridge (Mass.) Electric Light Company's policy is to acquaint the residents of its community with its service standards and facilities. The text of one folder inclosed with residence bills tells a simple story in a manner intended to cement public good-will relations.



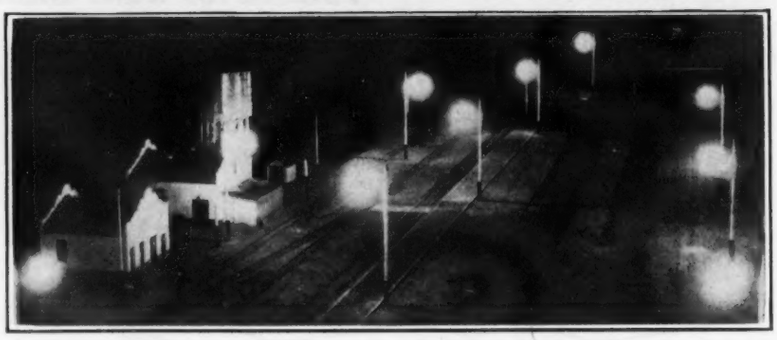
FEW MEN or few business firms look for trouble, yet our inspectors have been looking for trouble for twenty years. Not only looking for it, but finding it and fixing it. Suppose your lights, as you touch your button, do not come on; then you step to the telephone and report it to our office. A few minutes later, and it is seldom more than a few minutes, a man appears carrying a neat roll of tools and having an identification card. He sets to work and in a short while the trouble is repaired.

Night and day, Sundays and holidays, our trouble shooters await your call, and you are assured of prompt service rendered by courteous men who know their business.

Our trouble service is just one link in the chain which enables the Cambridge Electric Light Company to give good, reliable and continuous service.

CALLING PUBLIC ATTENTION TO A SERVICE WHICH IS OFTEN OVERLOOKED

New Lighting of Boise Station and Railroad Yard



NINETEEN pendant Novalux lighting units, suspended from brackets 30 ft. high and each equipped with a 1,500-cp. lamp, have been installed around the station and in the railroad yard in Boise, Idaho. The tower of the building is lighted by five 500-watt floodlighting projectors. The station and the poles upon which the units are mounted are painted white and present a very striking appearance, as may be judged from the illustrations.

Digest of Electrical Literature

Transmission, Substations and Distribution

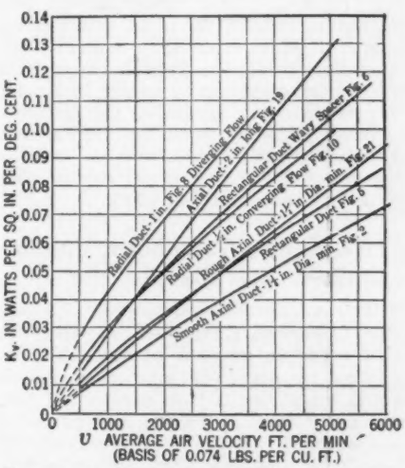
Porcelain Insulators.—W. WEICKER.—The article contains a published address given by the author before an engineering society and deals with the complete story of the design, manufacture and testing of high-voltage porcelain insulators of all known types. A short history of development is included from the first oil-filled insulator, used in 1891 on the famous Lauffen-Frankfort three-phase transmission system, to the most modern pin-and-chain types. Each model is briefly described and illustrated. Methods of forming and molding are explained, followed by ceramic details of firing in intermittent and continuous tunnel kilns. Of the testing methods are mentioned the flashover with operating frequency, the impulse method and the high-frequency test. In addition, mechanical tests are described. To determine the distribution of the electrostatic field on a chain of suspension insulators, the author describes Professor Toepler's straw-electroscope method and shows means to equalize the potential distribution along such chains by means of metallic ring shields. Finally thermal and porosity tests are mentioned. The article is illustrated with 46 photographs, drawings and curves.—*Zeitschrift des Vereines Deutscher Ingenieure*, Sept. 4, 1926.

Low-Frequency Intervalve Transformers.—P. W. WILLANS.—The theoretical expression for the voltage amplification of a valve followed by a transformer is developed in its simplest possible terms, and various particular cases are considered. A practical design of transformer is described in which low leakage inductance and self-capacity are insured by a sectionalized and spaced construction, and a curve of amplification of this transformer is given. Various questions relating to intervalve transformers are briefly considered, and circuits are described for increasing the amplification of low frequencies and the effective step-up ratio of the transformer. The use of low-frequency reaction for correcting distortion is described and is illustrated by measurements.—*Journal of Institution of Electrical Engineers (England)*, October, 1926.

Air-Insulated High-Voltage Transformers.—W. HESS.—The article describes the latest developments in the design of air-insulated testing transformers for very high voltages built by a Swiss firm in sets of three for an end potential of up to 1,000 kv. to ground. By a careful arrangement of the primary, secondary and exciting windings in relation to each other and to the iron core the dielectric stress upon the air is kept at all points of these windings well within the ionization point. The uniform distribution of the high potential is further aided by metallic shields, which envelop the most highly stressed parts of the windings. Experiences, covering now a period of more than two years, with such million-volt sets in Switzerland and France seem to have established their full reliability. Elaborate oscillographic tests were made on these two installations to determine the wave shape of the high-voltage current under various test conditions. Twelve characteristic oscillograms from this test series are reproduced and discussed. The author mentions that, owing to totally different spacing and arranging of the windings on an air-insulated transformer, the no-load power factor is about 0.96 lagging, while for similar oil-insulated transformers of American manufacture a leading power factor of 0.3 was measured. It is further stated that the possibility of providing a great many voltage taps on the open, air-insulated transformer results in a far more flexible apparatus than an oil type would permit. For example, three identical units, in various connections, utilizing their taps, may be arranged for five different single-phase and three different three-phase voltages, ranging from 93 kv. up to 1,000 kv. always at the same kva. output.—*Elektrotechnik und Maschinenbau*, Sept. 5, 1926.

Generation, Control, Switching and Protection

Surface-Heat Transfer in Electric Machines with Forced Air Flow.—G. E. LUKE.—The purpose of this paper, which appears in an abridged form, is to submit additional information that should be of value to the industry and that will also explain some of the inconsistencies which it is believed have been present in the past on the subject of heat transfer in electrical machinery. Considerable data in the past have, according to the author, been published concerning heat liberated from surfaces with natural convection currents, but it has been just recently that data applicable to electric machines with forced-air flow have been available. The new data presented in this paper are expected to correlate some of the work previously done which offhand seems to be inconsistent. To derive a general solution, taking into account the hydro-dynamical condition in addition to the physical property, seems visionary, the author says, at least as regards a practical solution. For the specific information which is desired by designing engineers of electric machines experimental results such as are submitted in a chart reproduced here must be used.—*Journal of A.I.E.E.*, November, 1926.



SUMMARY OF SURFACE-HEAT-TRANSFER CONSTANT AGAINST AVERAGE AIR VELOCITY FOR VARIOUS DUCTS

Units, Measurements and Instruments

Standards for Measuring the Power Factor of Dielectrics at High Voltage and Low Frequency.—H. L. CURTIS.—This paper points out the need which exists in the electrical industry, particularly in connection with the testing of high-voltage cables, for convenient standards for use in the measurement of dielectric loss. At present, according to the author of this paper, most laboratories make use of air condensers. In the paper these are classified and certain sources of error which must be guarded against are mentioned. Condensers with solid dielectrics would be much more convenient, more portable and cheaper, in the opinion of the writer, but so far none has been produced which has satisfactory constancy for use as a standard at high voltage.—*Journal of A.I.E.E.*, November, 1926.

Motors and Control

Rating of Crane Motors.—C. SCHIEBELER.—The recent ruling of the German V.D.E. concerning the proper rating of motors for intermittent service, such as three-phase and direct-current crane motors, is fully explained by a number of diagrams showing the output of such motors under various operating conditions. The factors of idle to running time, fixed to 15 per cent, 25 per cent and 40 per cent, are plotted on the abscissas, with the kilowatt-output as ordinate. Curves drawn in this co-ordinate system show the relation between these two variables. Numeric values are introduced by selecting standard crane motors of the open and inclosed type. It is pointed out that a factor rating, as mentioned above, is more satisfactory and correct than the straight time rating of 30, 60 and 90 minutes formerly used.—*Elektrotechnik und Maschinenbau*, Aug. 15, 1926.

Comparison of the Efficiency of Synchronous Machines as Determined by Various Methods.—P. L. ALGER.—In order, as the author says, to explain the reasons for possible variations in the figures for efficiency given by different manufacturers and in different cases for synchronous machines, there are given in this paper brief descriptions of the losses inherent in synchronous machines, of the methods by which they are determined and of the ways in which efficiency calculations are affected by various assumptions in regard to them. The author proceeds in detail to define and take up in their natural order the causes of variable losses which

occur in synchronous-machine operation and how they are taken into account in efficiency guarantees. In order to show the specific effect of the various possible methods of calculation and efficiency guarantees, the comparative results of numerical calculations for typical synchronous machines are presented in a group of tables. In each case the efficiency or losses and the basis of calculation which is in strict accord with the A.I.E.E. standards are given, together with the corresponding values for a number of progressively more lenient methods of calculation.—*General Electric Review*, November, 1926.

Electrophysics, Electrochemistry and Batteries

Common Properties of Addition Agents in Electrodeposition.—GIICHIRO FUSEYA and KWANJI MURATA.—The authors review the various theories that have been proposed to account for the beneficial effect on the cathode resulting from the addition of glue and other substances to the electrolyte. They then describe in detail experiments made with copper sulphate and with silver-nitrate baths, tabulating the results obtained with a large variety of substances introduced into the electrolytes. Among other things, it was found that those susbtances which increase the weight of the cathode deposit tend to reduce the size of the crystals in the deposit, whereas substances which do not vary the crystal size cause no increase in the weight of the deposit for the same amount of current. The formation of complex ions upon the addition of various substances to the electrolyte was carefully investigated by electromotive force and ion-migration measurements. The experiments showed that both copper and silver formed complex ions with metaphosphoric acid, tartaric acid and glycocoll, which are positively charged. In general, oxy-acids and amino-acids have the common properties of forming complex cations with copper or silver ions. These are the very substances which entered into the cathode deposits and caused the crystal size to be smaller. On the other hand, sugars and the higher alcohols do not form complex ions with copper or silver, or do so only to a very slight extent, and these substances do not in any way or only very slightly affect the cathode deposit. There appears to be quite a close relation between the property of forming complex ions and that of diminishing the size of the cathode crystals.—*Paper presented before the American Electrochemical Society*, Oct. 11, 1926.

Welding of High-Chromium Alloys Intended to Meet Extreme Conditions.—STANLEY M. NORWOOD.—There are many difficulties inherent in the welding of alloys containing more than 10 per cent chromium. The most serious problems are those of brittleness in the weld and in the base metal adjacent to the weld, according to the author—a brittleness that cannot be relieved even by heat treatment in alloys containing 20 per cent or more of chromium. The author has overcome these obstacles by the addition of 8 per cent nickel of high-chromium alloys. The objection of diminished corrosion resistance to sulphur products, generally accompanying the addition of nickel, has been removed by an addition of 2 per cent silicon. The presence of manganese in percentages equal to the silicon is said to improve the welding characteristics of the alloy. While the addition of nickel has been conceded to confer certain benefits, its presence has hitherto been undesirable in some applications because of its adverse effect on corrosion resistance in certain important instances. In the combined presence of silicon and manganese, however, the nickel is protected and the welding is facilitated, thus contributing in a double measure to progress in this field.—*Paper presented before the American Electrochemical Society*, Oct. 11, 1926.

Traction

Natal Railway Electrification.—The *South African Mining and Engineering Journal* of recent date contained a general description of the electrification of the Pietermaritzburg-Glencoe Railway in Natal, which was put into full operation April last. The electrification has been carried out on a 3,000-volt direct-current system with overhead catenary suspension. The energy is supplied from a power station at Colenso, which contains five 12,000-kw. turbo-alternators and eight 60,000-lb.-per-hour boilers. Alternating-current energy is transmitted at 88,000 volts for eleven substations. A twelfth substation at Colenso is connected directly to the power-station busbars at 6,600 volts. These twelve substations contain in all 21 2,000-kw. motor-generator sets which are automatically started under remote control from nearby signal cabins. The undertaking has proved successful from an engineering point of view, the only difficulty in operation being the trouble caused on the overhead system by severe lightning storms which occur during the summer months. Special protective apparatus is being installed to overcome this.—*Electrical Engineer of Australia and New Zealand*, Sept. 15, 1926.

Telegraphy, Telephony, Radio and Signals

Extraneous Interference on Submarine Telegraph Cables.—J. J. GILBERT.—In order to avoid a considerable reduction in speed of operation, which would have resulted on account of the unusually large parasitic disturbances encountered in the neighborhood of New York, the New York-Azores permalloy loaded cable was equipped with a new type of earth connection consisting of a conductor extending 100 nautical miles to sea and there connected to earth through an artificial line. This paper presents the theory of the new type of sea-earthing arrangement and discusses the sources of extraneous interference and the manner in which it is picked up by submarine cables. A method is developed for estimating the magnitude of terminal extraneous interference in the case of any particular cable.—*Reprint B207, Bell Telephone Laboratories, Inc.*

Frequency Characteristics of Telephone Systems and Audio-Frequency Apparatus and Their Measurement.—B. S. COHEN, A. J. ALDRIDGE and W. WEST.—A demonstration of the value of the frequency-amplitude characteristics of telephone systems or apparatus in determining the transmission efficiency, including volume and articulation efficiency. The audio-frequency ranges of importance for speech and music are then considered. Methods are described for the direct and indirect production of constant acoustic output over the audio range, and the calibration of acoustic measuring instruments is dealt with. The next section of the paper deals with the production of electrical energy of constant value over the required frequency range, and a description is given of a special form of oscillator, together with associated apparatus for the direct recording of frequency characteristics. The concluding part of the paper gives frequency characteristics of each part of the apparatus used in a telephone connection, and also of audio-frequency amplifiers and loud speakers. In the section dealing with lines will be found characteristics for unloaded open wires and cables and for loaded cables. An impedance-frequency characteristic is also given and its application to fault location illustrated. Under audio-frequency amplifiers some typical intervalve transformers of the type used for broadcast reception are characterized, and an extension is given of the theory of this type of transformer covering the effects of resistance and capacity loads.—*Journal of Institution of Electrical Engineers (England)*, October, 1926.

Miscellaneous

Electricity in Agriculture.—Following up the investigations carried on in Oregon in 1924, a further program was adopted for 1925-26 to ascertain facts concerning certain agricultural operations. These included the application of electricity to irrigation, to the lighting of poultry houses to stimulate egg production, electric incubation, dairying, the mechanical handling of produce, sheep shearing and other work. A summary of the work for the current year is given in a 48-page bulletin. As to irrigation, where electric power is available motors are replacing gas and steam engines for pumping. The electric motor does not require an engineer to operate it and saves time, labor and repairs. Irrigation is profitable with hops, early potatoes and truck crops. The bulletin gives data on which these conclusions are based. The lighting of poultry houses shows a profit for the months from October to February inclusive, but a loss in March. The highest gain is evidently in November, in which one flock of 114 pullets, with lighting, showed a gain in net profit of nearly 60 per cent over a similar one without lighting, the net profit over feed and light being $63.54 and $40.16 respectively. This is with energy at 10 cents per kilowatt-hour. The report gives further data on various other electrical applications investigated.—*"Electricity in Oregon Agriculture," 1926 Annual Report Agricultural College Experiment Station, Corvallis, Ore.*

News of the Industry

Sustains G. E. Lamp Plan

United States Supreme Court Finds that Agency System of Distribution Is Not Illegal

IN A DECISION handed down by Chief Justice Taft on Nov. 23 the United States Supreme Court sustained as legal the agency system for distribution of incandescent lamps of the General Electric Company and declared valid and legal the license granted by this company to the Westinghouse Electric & Manufacturing Company. The effect of the decision is to hold legal the system by which the General Electric Company controls the resale price of incandescent lamps. The federal government brought suit against the General Electric Company, the Westinghouse Electric & Manufacturing Company and the Westinghouse Lamp Company in the northern district of Ohio, charging a violation of the Sherman anti-trust law. The District Court dismissed the bill for want of equity, and this decision is affirmed by the Supreme Court.

In its suit the government charged that the defendant companies were evading a consent decree entered some years ago in a suit against the General Electric Company and other corporations in which restraint of trade had been alleged. It was charged under the later suit that the General Electric Company had what tended to be a monopoly on the sale of incandescent lamps through its agency system and that it used such system to fix resale prices illegally. In the second place, it was charged that it was achieving the same purpose through control of licenses for the manufacture and distribution of such lamps by the other defendants.

The decision by the Supreme Court goes at considerable length into a review of the stipulation of facts before the lower court. It asserts that although the agents of the General Electric Company distributing incandescent lamps are merchants, there can be no doubt that their relations to the corporation are those of agents of the company. This is established, the opinion states, by the fact that the General Electric Company pays freight on the lamps, carries insurance against them while they are in the stock of its agents, does not collect from the agents until lamps are sold to consumers, and so forth. The company therefore may dictate prices on its lamps until they are sold by its agents, the court holds.

The relationship between the General Electric Company and the Westinghouse Electric & Manufacturing Company, including the latter's subsidiary, the Westinghouse Lamp Company, is that between the owner of a patent and one licensed by the patentee, the court states. Under patent law, it points out, it is possible for the owner to make stipulations with the licensee, and hence the court finds nothing illegal in the stipulation which, the government charged, caused the Westinghouse company and its subsidiary to carry on the same general policies in regard to incandescent lamps that had been adopted by the General Electric Company.

No New Unit Under 50,000 Kw. for Big Insull Plants

In addressing the Electric Association of Chicago at the Drake Hotel in that city last week, Samuel Insull made the following announcement of engineering policy:

"The larger companies that supply energy directly to the Chicago district will not hereafter install any generating units of less than 50,000 kw. capacity. Units of larger capacity will be installed, of course, as conditions warrant, but nothing smaller. This decision would not mean much if it applied only to central stations in or immediately adjacent to the city of Chicago. The point of the decision is that nothing less than 50,000-kw. units will be installed in the outlying stations at Waukegan, Joliet and Michigan City; at Dresser, Ind., down on the Wabash River, near Terre Haute, and in the station to be built at Pekin, Ill."

Switching Station at Trenton for 132-Kv. Trunk Line

Transmission of electrical energy across the Delaware River near Trenton, N. J., has been made possible through the completion by the Public Service Production Company on Nov. 18 of a switching station at the city named. The tie is at 66,000 volts from the Philadelphia Electric Company's Richmond station through Bustleton, Bensalem, Bristol and Emilie, Pa. At the latter point a substation serves the Philadelphia Suburban Gas & Electric Company. Thence the line passes to Biles Island, on across the river and north to the outskirts of Trenton, where the voltage is stepped down to 26,400 for the distribution of power in the southern zone of the Public Service Electric & Gas Company.

The substation in question, which will later be operated at 132,000 volts on the high-tension side, as will the interconnecting line, is the first of a series of such stations planned for the distribution system of Public Service. The second substation, under construction near Passaic, will be connected at Kearny with the 132,000-volt line now operating as the link between this new generating station and the Essex and Marion stations.

The Trenton switching station comprises several interesting features, including two 30,000-kva. transformer banks, a 15,000-kva. condenser, outdoor 26,400-volt concrete reactors and motor-operated primary and secondary disconnecting switches.

Long Lines in Parallel

Interconnection of Transmission Systems from Massachusetts to Wisconsin Completed at Piney

CLOSING of a switch in the Piney hydro-electric station of the Penn Public Service Corporation on the Clarion River in Pennsylvania at 11:47 a.m. on Friday, Nov. 19, brought into parallel operation interconnected transmission systems stretching from Milwaukee to Boston. The closing of the switch tied together the lines of the West Penn Power Company and the Penn Public Service Corporation. By previous arrangement, as explained by H. Hobart Porter, president of the American Water Works & Electric Company, the companies composing the integrated systems on east and west were at the same time being operated in parallel, so that upon the closing of this switch there were operated as a single system electric lines stretching from New Hampshire through Boston, Providence, Albany, Buffalo, Pittsburgh, Cleveland, Toledo, Chicago, Milwaukee, Charleston, W. Va., and Roanoke, Va., with hundreds of intervening towns and cities in fifteen states.

The operating companies thus brought together produce, Mr. Porter estimated, one-third of the electrical energy of the United States. In reverse direction from that just given, the interconnected lines run through the States of Wisconsin, Illinois, Indiana, down the Ohio Valley into Pennsylvania, thence up to the Adirondacks and eastward through Vermont and New Hampshire, down into western Massachusetts, connecting with the New England Power and Boston Edison circuits at Sudbury. No energy, of course, was transmitted between the ends of the combined lines, although the daily newspapers jumped to the conclusion that this feat had been performed and had Chicago operating lamps in the Back Bay district of Boston. From 10,000 kva. to 12,000 kva. was required at Boston for charging current on the eastern New England end of the test. It is expected that a study of this tie-in will throw considerable light upon the important subject of transformer standardization for interconnected service with particular reference to voltages.

Southeastern Power & Light to Enter Charleston, S. C.

Charleston (S. C.) newspapers report that as the outcome of a meeting in that city on Nov. 16 of directors of the railway, lighting and gas utilities there, including the Charleston Consolidated Railway & Lighting Company, by which the three other concerns — the Charleston Consolidated Railway, Gas & Electric Company, the Charleston Gas Light Company and the Charles-

ton-Edison Light & Power Company—have been controlled, a merger of the four into one company, to be known as the South Carolina Power Company, was arranged. This will clear the way for the long-rumored acquisition of the Charleston utilities by the Southeastern Power & Light Company. A meeting of the stockholders of the four local companies has been called for Dec. 17 to ratify the sale of the properties.

The Southeastern Power & Light Company has already prepared to enter South Carolina through the contemplated building of a hydro-electric plant on the Savannah River, near Clark's Hill, S. C., 21 miles above Augusta, Ga., with transmission lines running north to Charleston. The application to the Federal Power Commission for this site in the name of a new Southeastern company subsidiary, the Savannah River Electric Company, was noted in the ELECTRICAL WORLD for Nov. 13 (page 1031). As noted this week under "Men of the Industry," Philip H. Gadsden has resigned as president of the four local Charleston companies, and Stuart M. Cooper has been elected to the presidency of the Charleston Consolidated Railway & Lighting Company.

Plan to Regulate Interstate Contracts

Power Committee of New England Council Reports Voluntary Agreement Among Utility Companies to Insert Clause Agreeing to Jurisdiction of Joint State Commissions

PUBLIC aspects of interstate power-contract regulation occupied a prominent place in the proceedings of the second New England Conference, held at Hartford, Conn., last week, with a total attendance of twelve hundred delegates, representing practically all branches of industrial, agricultural and business activity in the Northeast. At a special session Thursday afternoon the power committee of the New England Council, headed by E. O. Goss, president Scovill Manufacturing Company, Waterbury, Conn., presented a plan for the regulation by joint state commissions of interstate power contracts. This plan, as previously outlined in the ELECTRICAL WORLD, provides for the voluntary insertion by power companies of the following clauses in contracts involving the interstate transmission of energy:

"After three years from the date hereof, if at any time either of the parties hereto shall make a written claim upon the other party that the rates herein, not subject to regulation by the constituted authority of any state, are unjust or unreasonable and the said parties fail to agree within six months after the date of said written claim upon new rates, then either party may file an application with the public service or public utilities commission of either of the states between which the sale or transmission of electric current, power or service shall take place under the terms of this contract requesting that the disagreement between said parties shall be determined by the public service or public utilities commissioners of each of the said states. If the public service or public utilities commissions of each state, acting through a majority of each board after hearing the parties, shall determine in accordance with law that a modification of the contract in respect to the rates set forth herein should be made, such determination shall, from and after the date fixed in such determination, act as an automatic revision of the rate schedule fixed in said contract, and such revised rate schedule shall remain in force for five years from the date of such determination, after which either party may again ask for arbitration or rates in the manner hereinbefore described."

In presenting this plan Chairman Goss stated that whereas such a voluntary agreement among power companies cannot have the same scope and effect as law, it is believed that this method may serve to meet the existing situation until Congress shall enact a law delegating to the states the powers of the federal government to regulate interstate commerce in electrical energy. A majority of the conferees concerned in drafting the above clauses felt that it would have been desirable if the proposed voluntary agreement could have given the state commissions the power to initiate in all cases examination and revision of interstate power rates and agreements. However, in view of the fact that all the state commissions in New England are not authorized by law to initiate proceedings within their respective jurisdictions, and the further fact that complete agreement could not be attained among all parties in interest at this time, this additional proposal has been held in abeyance. During the coming year the Council expects to consider further the points of difference among the New England States with respect to power matters, which include legislative restrictions upon the exportation and importation of energy, scope of commission authority, systems of accounting and taxation practices. With all its limitations the foregoing plan for joint regulation has been in responsible quarters outside New England declared to be as far as it goes the most constructive proposal yet brought forward anywhere in the United States for dealing with a problem that is national and not peculiar to New England.

POWER COMPANIES AGREE

On behalf of the power companies represented Chairman Charles L. Edgar of their committee stated that these utilities agree to adopt the regulative clauses above printed and to urge their use by all others. For the committee representing the governors of the states, W. C. Bliss, chairman of the Rhode Island Public Utilities Commission, emphasized the necessity of providing a means of regulating interstate power contracts in the absence of federal legislation upon the subject. "Has industry and the service of the public got to await the legal determination of these aspects of power interchange through the processes of all our courts?" asked the speaker, "or are we going to try to devise some method by which our industries will not die while they are waiting for the answer from the courts?" Mr Bliss pointed out that if the states are stripped utterly of their jurisdiction and the federal government fails to pass legislation controlling the situation, then the states in self-defence are going to be forced to protect themselves by legislation against abuses that may arise from interstate power contracts which do an injustice to either of the states involved, and that would mean restriction of development. "On the other hand;" said the speaker, "you have the other danger of getting federal legislation which will place your regulation just as far off from your industries and your people as the Interstate Commerce Commission's regulation over railroads is away from the shipping and the public today, and the delays that are involved in securing justice before the Interstate Commerce Commission could not be withstood by the manufacturing industries of New England if applied to the power situation."

STATE GOVERNORS APPROVE

It is the belief of the representatives of the New England governors and the state regulatory bodies that the proposed clause for the regulation of interstate power contracts will rarely if ever have to be used and that with such a provision the parties will adopt a course of equity and fair dealing with one another that will avoid the necessity for exercising this conferred power. Another advantage is that this plan will stave off the possibility of the passage of national legislation centralizing this authority in the Interstate Commerce Commission, so far away from home. In answer to the claim that federal legislation is necessary, the power companies can point out that they have adopted an effective system, and that if any legislation is required the federal government may by statutory enactment give to the states the right to do the thing that is now accepted under the agreement of arbitration included in the contracts between power companies.

At a dinner Thursday evening to delegates, at which Governor Trumbull of Connecticut was host, an address by Owen D. Young, chairman of the board General Electric Company, was read in the speaker's absence by Vice-president E. G. Buckland of the New York, New Haven & Hartford Railroad. Mr. Young reviewed the movement for pooling the power resources of New England and urged the elimination of all artificial barriers between states in the interest of economic prosperity and mutual progress.

Following the conference, Samuel Ferguson, president of 'he Hartford Electric Light Company and Connecticut Power Company, indorsed the recommendation of the power committee and on behalf of these companies stated that he accepted the same concurrent regulation in interstate transactions as today legally exists in intrastate transactions.

Chicago Canal Diversion

Fight Over the Sanitary District's Use of Water from Lake Michigan Waxes Warm

WHILE Charles Evans Hughes is sitting at Washington as special master appointed by the United States Supreme Court to hear the suits brought by various states bounded by the Great Lakes against the city of Chicago because of the diversion of Lake Michigan water through the Chicago Drainage Canal, agitation on the subject continues. At a meeting last week of the Great Lakes Harbors Association of the United States and Canada, held at Buffalo, William G. Bruce of Milwaukee, president of the association, called Chicago an outlaw ignoring the rights of its neighbors and defying the nation's laws. Representatives of other states were equally emphatic, while M. F. Fennell, Jr., of the Shipping Federation of Canada, termed the diversion an infringement of Canada's rights and the violation of an international treaty. "Neither Canada nor her shipping interests," he declared, "will ever accept compensation for the diversion, but will insist on the water itself, and nothing else."

Mr. Fennell's remarks were in line with an interview recently published in a Toronto newspaper in which Arthur V. White, consulting engineer of the Ontario Hydro-Electric Commission, expressed himself as follows:

"The water abstracted by the Sanitary District of Chicago, which, of course, is entirely lost to the Great Lakes drainage basin, could, at Niagara and in the whole St. Lawrence River, develop about as much power as can be produced in the Queenston-Chippawa development. The loss in power due to the abstraction of 10,000 cu.ft. per second at Chicago would be about 300,000 hp. at Niagara, plus 200,000 hp. in the St. Lawrence. This power cannot be restored without restoring the abstracted water. No so-called compensatory or remedial works for the restoring of lake levels can compensate or effect any remedy for the loss of water needed for power. Abstracted water results in the absolute loss of power. Every thousand cubic feet of water taken from the Great Lakes system at Chicago results in the loss of 50,000 hp. at Niagara and on the St. Lawrence."

A different point of view is taken by Representative Cleveland A. Newton of Missouri, who at a meeting of the Mississippi Valley Association, with delegates from 26 states, held at St. Louis on Nov. 22, attacked the "power interests" of New York and the St. Lawrence for opposing limited diversion of Lake Michigan water to the Illinois River. They raised no hue and cry, he said, until they discovered "the tremendous value to them of the water which for twenty years had been going from the Great Lakes down the Mississippi to the Gulf."

At the Mississippi Valley Association convention Secretary Hoover said:

"Lawyers, courts or legislative debate cannot cure climatic lowering of the levels in the lakes—these are engineering jobs. Litigation and political action produce feelings, but they do not produce water. I ask all the lake regions to consider whether before these controversies go further we should not spend our money on cement and steel rather than upon the courts and on political agitation."

National Grange Favors Lease of Muscle Shoals

Meeting at Portland, Me., on Nov. 18, the National Grange, after a two-hour debate adopted, by a vote of 27 to 21, a resolution recommending the leasing of Muscle Shoals to a responsible company making the best offer and complying with conditions designed to benefit agriculture. The delegates favored leasing the government plant to a company "agreeing to manufacture a high-grade fertilizer material carrying not less than 40 per cent plant food," in compliance with the terms of the national defense act of 1916.

The resolution was a compromise between two, introduced respectively by A. G. Goss of Washington, who advocated government operation, and by David H. Agans of New Jersey, who asked the National Grange to favor a lease to the American Cyanimid Company.

New Office Building for Philadelphia Electric Company

Plans for a 30-story office building at Ninth and Sansom Streets are being prepared by architects of the Philadelphia Electric Company. This building will supplant the company's present quarters at Tenth and Chestnut Streets. The site, which adjoins the company's substation on Sansom Street, is 100 ft. by 104 ft. The structure will be of steel and concrete and will cost several million dollars. Work is expected to start soon.

St. Lawrence Report Ready

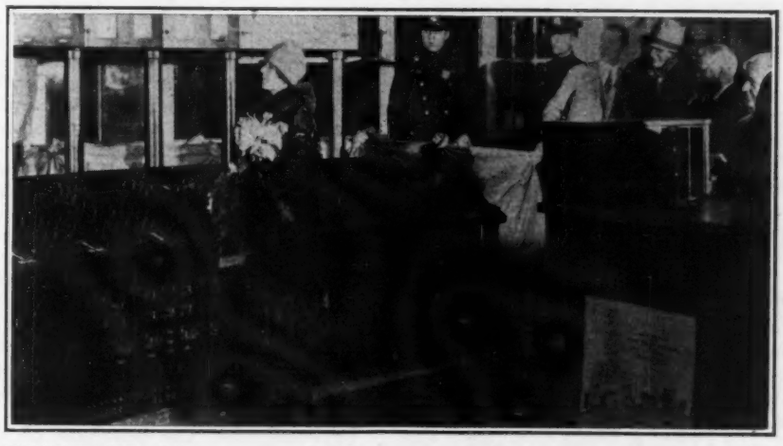
American and Canadian Members of Joint Engineering Board Arrive at Differing Conclusions

THE international Joint Engineering Board, which for the last two years has been considering the question of the proposed improvement of the St. Lawrence River waterway from Montreal to Lake Ontario, for both navigation and power, has completed its basic report.

The report covers the engineering features of the whole project, including the cost. It goes into the fundamental questions whether the scheme which the original engineering board submitted in 1921 is practicable, whether the estimates of the costs made by that board require revision, and the extent to which the water levels in the St. Lawrence River at and below Montreal, as well as river and lake levels generally, would be affected by execution of the project. The report indicates that the American and Canadian engineers have failed to agree on a plan for the development of the Great Lakes-St. Lawrence waterways. The American section proposes a full single-stage power development in which all the practical head available in that section of the river would be concentrated in one dam below Long Sault Rapids at the foot of Barnhart Island. The Canadian section proposes the development of power at Ogden Island, near Morrisburg, and at the Long Sault in a double-stage scheme.

The total installed capacity of the two plans would be: Single-stage (American plan), 2,730,000 hp.; double-stage (Canadian plan), 2,619,000 hp. The estimated cost of the development of power alone in the St. Lawrence under both projects is: Single-stage, $290,172,000; double-stage, $308,792,000. The estimated cost of improving

Queen of Roumania Opens New York Edison's Station



ADVANTAGE of the presence in New York City of Queen Marie of Roumania was taken by the officials of the New York Edison Company to induce her to open officially the company's new East River generating station by moving the switch that set the first generating unit—a 60,000-kw. machine—revolving. This event took place on Tuesday afternoon, Nov. 23, and was among the last functions attended by the Queen, who sailed for her home the following day. Among the company officials who met the Queen at the power house were Vice-presidents Lieb, Murray, Torchio and Williams, as well as George B. Cortelyou, president Consolidated Gas Company. A letter of regret at his unavoidable absence was read from President Nicholas F. Brady.

the St. Lawrence for navigation alone is $167,720,000 under either scheme.

From Lake Ontario to Montreal only the estimated cost is: Single-stage, $394,000,000; double-stage, $423,600,000. From the head of the lakes to Montreal the estimated cost is: Single-stage, $553,200,000; double-stage, $582,800,000. This includes the entire cost of the Welland Ship Canal, estimated at $114,000,000. All costs are figured without interest during construction.

The board estimated that the cost to restore the effects of Chicago water diversion would amount to $6,358,000, divided as follows: At outlet of Lake Huron, $1,350,000; at foot of Lake Erie, $400,000; at and below Montreal, $4,608,000. The effect of the diversion on the levels of Lake Ontario and the St. Lawrence above Montreal would be removed by the work projected for the improvement of the river. A 25-ft. waterway is proposed for Lake Ontario to Montreal, involving 25 miles of restricted canal navigation, nine locks and eight bridges. The time to complete all works is forecast as eight years.

The commission's report is signed by Major General Jadwin, chief of United States Engineers; Colonel William Kelly of the United States Engineering Corps and Lieutenant-Colonel G. B. Pillsbury, on behalf of the United States. It is signed by the following Canadians: Duncan W. McLachlan, engineer in charge of the St. Lawrence investigations for the Department of Railways and Canals, Ottawa; Oliver O. Lefebvre, chief engineer Quebec Streams Commission, and Brigadier-General Charles H. Mitchell, Toronto. The report is the result of twenty months of work.

H. L. Clarke Charges Libel

A libel suit asking $250,000 damages has been filed by Harley L. Clarke, head of the Utilities Power & Light Corporation, Chicago, the holding company under whose control the two Indianapolis light and power companies will come if the proposed merger is authorized. This suit is brought against Alvah J. Rucker, Indianapolis corporation counsel, whose accusations of corrupt political dealings affecting Mr. Clarke as well as Samuel and Martin Insull and other utility men were reported last week (page 1081).

Delay Likely in Hearings on Indianapolis Merger

There will be a delay of possibly two weeks by the Indiana Public Service Commission before it determines whether it has jurisdiction in the proposed merger of the two Indianapolis central-station companies into the Indianapolis Power & Light Company. The commission will be guided largely by the opinion of the Attorney-General of Indiana in this decision. On the outcome of the commission's action on this question, which was raised by attorneys representing interests in Indianapolis seeking to frustrate the merger, will hinge the actual date for a hearing on the proposed merger, if one shall be held.

Although Frank Wampler, the commissioner to whom the case was assigned, has declared that the valuations and inventories of all properties involved have been virtually completed, it is said that some members of the commission feel that a period of six months should be devoted to a thorough inventory and valuation of the two utilities before a hearing is held.

Purchases and Mergers

Byllesby Company Buys Midwest Public Service Company—Small Local Plants Change Hands

PURCHASE of the Midwest Public Service Company, supplying electricity to a group of twelve communities in Wyoming, southeastern Montana and southwestern South Dakota, is announced by H. M. Byllesby & Company. The new properties will be operated as part of the Casper (Wyo.) division of the Mountain States Power Company. Electric service is furnished to the towns of Baker and Forsyth, Mont.; Edgemont, S. D.; Byron, Greybull, Hudson, Lovell, New Castle, Pavilion, Riverton, Warland and Yoder, Wyo. General offices are at Casper.

The Arkansas Light & Power Company has bought the light and power plant of the Arkansas Public Utilities Company at Heber Springs, Ark., the price said to be about $60,000.

The W. B. Foshay interests of Minneapolis have bought the New Richmond Power Company, serving New Richmond, Star Prairie, Stanton, Deer Park and a rural territory from its water-power properties. It will be consolidated with the People's Wisconsin Hydro-Electric Corporation.

The Lake Superior District Power Company extended its territory further south by taking over on Nov. 1 the Glidden Light, Power & Water Company, serving Glidden.

The George (Iowa) Electric Light & Power Company, which has been operated by H. C. Hatch for the last fourteen years, has been purchased by the United Gas Improvement Company. The village board of Homer, Neb., has signed a contract with the Central States Electric Company, Cedar Rapids, Iowa, whereby the company becomes the owner of the municipal plant.

The Interstate Public Service Company has asked the Indiana Public Service Commission to approve its purchase of the Pine Village Light & Power Company for $10,367.

The Tonawanda (N. Y.) Power Company has made application to the New York Public Service Commission for approval of the merger by it of the Grand Island Light & Power Corporation, which supplies the town of Grand Island, in the Niagara River.

Proposals for the purchase of the municipal electric, ice and water properties at Fernandina, Fla., have been submitted to the Fernandina City Commission by Paul C. Dodge & Company, Chicago, and the Florida Power & Light Company, Miami. The Chicago concern offers $417.500 for the three utilities and the Florida Power & Light Company offers $385,000 for the ice and electric plant without the waterworks.

Good Meeting at Santa Cruz

Pacific Coast Commercial Men's Problems Are Discussed in a Pointed and Practical Way

WHAT was generally conceded to be the finest meeting of the Commercial Section of the Pacific Coast Electrical Association in recent years was held at Santa Cruz, Cal., Nov. 12 and 13, under the chairmanship of H. K. Griffin. A general meeting, a feature new to these gatherings, held on the afternoon of the first day, was attended by 125 men from all parts of the state. The addresses of three principal speakers and the frank discussion which followed did much to focus attention and clarify the atmosphere.

S. Waldo Coleman, president of the association, showed that while California has been a national leader in total generation and sale of electrical energy, it ranks well down the list in average annual kilowatt-hour sales per domestic consumer. The national average is 365 kw.-hr. per customer, but in California the average is only about 300 kw.-hr. per customer. This, he said, should cause executives and commercial managers of California central stations to make an inventory and find out how to rectify the situation.

A. C. McMicken, general sales manager of the Portland Electric Power Company, unqualifiedly indorsed central-station merchandising and presented excerpts from letters and telegrams from the commercial managers of nearly all the large utilities in his section indorsing this policy. He showed that by a unanimity of commercial policy and practices and active appliance merchandising by Northwest central stations they have been building load faster than the normal growth and have boosted the average consumption per domestic consumer well above the national average. This has taken place without any change in rates and is due in part to better standards of illumination and in part to the use of energy-consuming devices such as electric ranges and water heaters.

Sales problems and the training of salesmen were discussed by Ray W. Turnbull, Pacific Coast manager Edison Electric Appliance Company. "Commercial men and salesmen must get the idea out of their heads that we are approaching saturation in the use of appliances," declared the speaker. "Some Pacific Coast power companies that already have a high degree of range saturation have sold 8 per cent of their domestic customers ranges this year alone, illustrating what can be done with this one appliance. Men are the limiting factor in any sales campaign, he said, going on to outline the qualifications of real salesmen.

Friday and Saturday mornings were devoted to committee meetings, when work for the year was planned. One of the major objectives of the Commercial Section of the Pacific Coast Electrical Association this year is the formulation of a program which will bring continuity and permanence to its work. A preliminary report looking to this end was presented at the Santa Cruz meeting and will come up for adoption at a later date.

Virginia Association May Join East Central N.E.L.A.

A speech on "Public Utility Franchises in Virginia" by T. Justin Moore, general counsel of the Virginia Electric & Power Company; a paper on "The Water Power of Virginia" by Wilbur A. Nelson, state geologist; an address by Miss Helen E. Steiner of Cleveland on women's part in the electrical industry, and a talk by D. L. Gaskill, secretary of the East Central Geographic Division, N.E.L.A., formed part of the program of a two-day convention of the Public Utilities Association of Virginia, held at Charlottesville, in that state, on Nov. 19 and 20.

In his annual report President F. W. King discussed what he thought should be the proper relation between the utility industry and the Legislature of the state. Charles Brooks of the Fitkin Utilities vigorously disputed the belief that electric railways are on the decline, calling it a "colossal untruth." J. W. Hancock, general manager Roanoke Railway & Electric Company, read a report regarding the advisability of the association becoming in conjunction with Maryland part of the East Central Division, N.E.L.A., instead of a part of the proposed Middle Atlantic Division, which was to consist of Virginia, Maryland, Delaware and the District of Columbia. Action on the report was deferred until next year's convention.

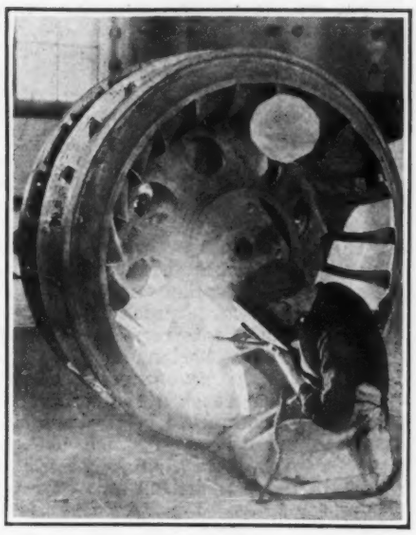
More than two hundred men and women attended the meeting. These officers were elected: President, William E. Wood of Richmond, vice-president and general manager of the Virginia Electric & Power Company; vice-president, R. Gray Williams of Winchester, J. W. Hancock of Lynchburg and A. W. Higgins of Charlottesville; secretary-treasurer, A. H. Hermann, Richmond.

Welders Meet at Buffalo

New Atomic Torch Described—Professors Discuss the Function of Colleges—Welding Structural Steel

A DEMONSTRATION of the atomic welding torch, made by R. A. Weinman of the General Electric Company, who described briefly the theory of its operation, was a leading feature of the fall meeting of the American Welding Society, held at Buffalo, Nov. 16 to 19 inclusive. This torch directs a stream of hydrogen between the poles of an electric arc, where the molecules of hydrogen are split into individual atoms. Issuing from the arc, these atoms shortly recombine into molecules under the generation of intense heat. Streams of hydrogen bathe the weld and the adjacent heated portions of the work, preventing oxidation.

A session was devoted to a group of papers by technical professors on the place of welding in the engineering curricula of universities. A questionnaire sent to a large number of technical schools by Prof. S. T. Hart of Syracuse showed that 30 per cent used electric welding apparatus in shop work, 60 per cent gas apparatus and 10 per cent thermit apparatus. The general agreement was that colleges should not train welding specialists, but teach fundamentals of design and familiarity with apparatus. Prof. Comfort A. Adams predicted enormous growth in the application of the welding process.



MAKING AN "IMPOSSIBLE" BRONZE WELD

A. M. Candy of the Westinghouse Electric & Manufacturing Company gave the results of a large number of tests made on structural-steel joints fundamentally designed for arc-welded connections. These tests were conducted at the Carnegie Institute of Technology. One of the advantages claimed was the possibility of producing a continuous beam effect with greater strength for a given beam section. The importance of designing welded structures and equipment for welding, rather than trying merely to replace rivets by welding, was emphasized.

More than forty exhibitors displayed a great variety of machines and equipment. Not the least interesting occurrence at the meeting and exhibition was the demonstration of welding broken bronze runners of turbines given by Rudolph Long, the man who accomplished the task after others had declared it impossible. Mr. Long joined the Niagara Falls Power Company's repair gang 22 years ago. He was led to wonder whether it was really necessary to scrap these runners, which cost $5,000 apiece, and one day obtained permission to try what he could do on one. His very first weld was successful, and now broken runners can be repaired thoroughly for about $500. One belonging to a 10,000-hp. machine which was renovated seven years ago is still in operation at Niagara Falls. "It's simple enough," Mr. Long said modestly. "I just worked around and discovered that all bronze must be welded from the positive side and that no air or draft must hit the weld. The welding current is used at 60 volts and 350 amp."

Work of Federal Power Commission Grows

Strong Plea for Permanent Staff Made in Annual Report—Regulation of Conowingo Finances Recounted—Scenic and Recreational Considerations Explained and Weighed

RELEASE of the sixth annual report of the Federal Power Commission was made on Monday, Nov. 22. It begins with the following summary of projects authorized in the last fiscal year and also since the organization of the commission six years ago:

"It was stated in the latest annual report of the commission that the preceding four years had witnessed the greatest water-power development in our history, and that it could scarcely be doubted that one of the primary factors in this development had been the federal water-power act, under the terms of which there had been offered for the first time conditions safeguarding the large investments required. This conclusion is fortified by the experience of the past fiscal year, during which construction was started upon 20 new projects which will have, when completed, an installation of 1,220,000 hp., or 40 per cent of the total placed under construction during the preceding five years. Among these new projects are the Lock 18 development of the Alabama Power Company on the Coosa River, in Alabama, with 180,000 hp.; the combined power and navigation development at the Falls of the Ohio, Louisville, Ky., with 135,000 hp.; the Conowingo development of 473,000 hp. on the Susquehanna River in Maryland and Pennsylvania, and five projects in California aggregating 417,000 hp. These projects bring the total of plants placed in operation or under construction under license of the commission since July 1, 1920, to 3,900,000 hp."

PLEA FOR LARGER STAFF

The report then deals with the general status of the commission's work, reiterating its former appeal for a larger staff than it is now permitted to employ under the system of temporary assignment of employees from the Departments of War, Agriculture and the Interior. The commission has been able to keep abreast of the large numbers of minor cases, to weed out a considerable number of speculative applications and to dispose of approximately one-half of the applications of primary importance; but "when consideration is given to the character of a large number of the major applications as, for example, the development at Louisville on the Ohio River, which involves not only a power installation of 135,000 hp. but also the navigation improvement of one of the most important internal waterways of the United States; the Conowingo project on the Susquehanna River, which affects the interests of two states and will cost more than $50,000,000; the series of projects under way by the Southern California Edison Company, which will require an expenditure of some $135,000,000, and the St. Lawrence projects, which, when

undertaken, must be handled by the commission with due regard to the public interests of the State of New York, of the United States and of Canada, as well as to the hundreds of millions of investment that will be required, a better appreciation can be had of the task placed upon the commission and of the utterly inadequate means which have been given it to perform that task."

For instance, in the one item of negotiating agreements and auditing current expenditures, for which unsettled claims still aggregate $150,000,000, the commission has a force of only four accountants. Without increase in personnel it is estimated that it would require not less than five years to bring this work up to date even if no new cases arose, but the fact is that every license issued adds to the task.

REGULATION OF SECURITY ISSUES

Under Sections 19 and 20 of the federal water-power act the commission has power under certain conditions to regulate the issuance of securities by corporations which take out licenses or by any person, association or corporation which may participate in the production, transmission, distribution or sale in public service of power developed by licensed projects. Such jurisdiction or power is limited to those cases where there is no state agency authorized to regulate security issues. The first exercise by the commission of this authority occurred during the fiscal year covered by this report and in connection with the Conowingo development on the Susquehanna River. The report deals at length with this project, describing its physical characteristics and giving a detailed account of the scheme of financing finally approved by the Federal Power Commission conjointly with the Public Service Commissions of Maryland and Pennsylvania. "The Conowingo case," it concludes, "has furnished an excellent test of the regulatory features of the act and has demonstrated that with such cordial co-operation as existed in this case there need be no conflict in matters of regulatory jurisdiction between the federal commission and the commissions of the several states."

SCENERY AND RECREATION

Turning to another aspect of the commission's work, the report says:

"There occasionally come before the commission applications for power projects which conflict in a greater or less degree with, or may cause injury to, areas of scenic attraction. There are other cases in which opportunities for providing recreational facilities will be created by a power development. The conflict of power developments with areas of scenic attraction may be of such a character that the two uses, power or park, are mutually exclusive, or they may be of such a character that by appropriate adjustments the two uses may be had without substantial injury to either. . . . So far as existing national parks are concerned, the Federal Power Commission has no authority to license a power development therein, such authority resting in Congress alone. There have been cases, however, where the commission has been asked to deny applications for license on the ground, among others, that the area involved should be reserved exclusively for recreation purposes. In one case, on Spirit Lake in Washington, the commission rejected the application on the grounds that the area was at present more valuable for recreation purposes, and that there was no local need for the power and no evidence of ability in the applicant to finance and develop the project.

"There have been other cases before the commission where investigations indicated that recreation use and power development might proceed together without essential interference. A good example is Lake Chelan, in Washington. . . . On reviewing this case the commission reached the conclusion that adjustments could be made in the proposed operations of Lake Chelan with those of other reservoirs on the system of the Washington Water Power Company so as to preserve without substantial injury the scenic and recreational values of the lake during the recreation season. Conditions were, therefore, put in the license that wherever submergence of shore lands took place the areas should be cleared of all trees and brush and kept cleared in order that there might be no dead material projecting above the lake surface; while, in order to avoid the drawdown of the lake and the exposure of unsightly shore line during the recreation season, provisions were placed in the license requiring the maintenance of lake levels at approximately the maximum during the period from June 15 to Sept. 15 of each year. . . .

"In acting upon projects where both power and recreational values are involved appropriate consideration must be given to the rights and needs of those who live in the immediate vicinity and whose economic welfare or social opportunities may be in large degree dependent upon the proposed development. There are many undeveloped or only partially developed sections of this country whose industrial progress is dependent upon the development of the natural resources which they possess, one of which is potential water power. The rights and interests of these local communities are as worthy of consideration as those of distant communities which, in order to be able to avail themselves occasionally of the scenic attractions of the areas, would keep them indefinitely undeveloped. . . . While the commission has no lack of interest in or appreciation of the value of natural scenery, or recreation, or of opportunities for its exercise, it cannot consider that aspect exclusively in the projects with which it deals. It must view all these matters in their broadest social relations and give to each its appropriate weight. Wherever reasonably possible the commission is inclined to adjust the two uses so that both may be had, in the belief that the two together—power development and recreation facilities—will, in general, render a greater social service than either one alone."

The report concludes with an account of the sectional meeting of the World Power Conference held at Basle, Switzerland, Aug. 31-Sept. 8, and attended by about seven hundred representatives from 38 different countries.

McCarter Tells What Interconnection Means to His State

"In planning to meet the state's future electric requirements we must look for the most economical and efficient sources of supply whether they be within or without its boundaries," declared Thomas N. McCarter, president of the Public Service Electric & Gas Company, in a paper read on Nov. 19 before the New Jersey Utilities Association, meeting at Atlantic City. "New Jersey has no coal mines, and it has practically no water powers capable of development. In both these respects adjoining states are more fortunate, and interconnection makes it possible to share in their advantages."

For every horsepower of load carried in 1925 by New Jersey companies 2½ hp. will be demanded by 1935 and more than 5 hp. by 1945, said Mr. McCarter. The load carried by New Jersey companies in 1925 amounted to 450,000 kw. In 1935 it will be 1,125,000 kw., and in 1945, 2,300,000 kw. Domestic, industrial and railroad requirements will cause the increase.

Power interchange will, because of conditions peculiar to the state, prove of particular benefit to New Jersey, Mr. McCarter said, pointing out that the peak load of the territory along the coast came at 8 p.m. in the summer months and the peak load for the industrial section of the state at 5 p.m. in the winter months, making possible the use of the winter surplus capacity of interior plants on the coast during the summer, and vice versa. Power interchange between New Jersey and the Pennsylvania mining districts would also be mutually advantageous. Work at the mines stops at 4 p.m., releasing a supply of energy that would assist in meeting the 5 o'clock New Jersey peak. The New York Edison Company, because a large proportion of its business is lighting, is at any time between May and October subject to a "thunderstorm peak" that adds as much as 200,000 kw. to its load, Mr. McCarter said, and while New Jersey companies do not face a similar condition, they too are subject to sudden demands that tax their resources. Power interchange would level these peaks and save investment in apparatus used only to meet them. If power interchange were now effective, in New Jersey alone it would, he declared, mean a saving in combined capacity of 60,000 kw. out of a total combined capacity of 647,000 kw., and in ten years would result in a saving of $15,000,000 in investment. If the interconnection were extended to adjoining states, the saving in investment by 1935 would be $60,000,000.

Mr. McCarter mentioned as possible sources of future electric supply for New Jersey the Conowingo station on the Susquehanna, mine-mouth stations now being built and to be constructed in Pennsylvania, St. Lawrence River, Adirondack and Delaware River plants.

Warren R. Voorhis, vice-president of the American Water Works & Electric Company, told the association that the investing public had become as important to the utility holding company as had the consumer of gas, electricity or water.

Growth in Lone-Star State

President of Texas Power & Light Tells How Scattered Territory Is Served —2,000 Miles of Transmission

IN THE year 1925 276 miles of transmission lines of 11,000 volts and higher were erected and 160 miles of distribution system were built by the Texas Power & Light Company, according to a statement concerning the company's progress made by President C. E. Calder of Dallas. In this work only 3.68 miles of steel-tower construction were erected, as the company gives preference to creosoted pine poles, which have been found to be almost as satisfactory as the steel towers and substantially cheaper. In reviewing the growth of the power transmission system and community service of his company Mr. Calder said:

"The Texas Power & Light Company and affiliated companies have overcome the non-density obstacle by reaching out into new territory and by a more intensive cultivation of the territory served. An idea of the range of the transmission lines of the system is gained from the fact that, including line connections with other companies, they reach 416 miles from north to south and 292 miles from east to west, covering approximately 40 per cent of the land area of the state.

"At the time of its organization in 1912 the company served seven towns with a total of 8,900 customers, while at the end of 1925 it served 208 communities with a total of 96,507 customers, of whom 72,912 were residential. During 1925 kilowatt-hour sales totaled 255,953,191, or a gain of 18 per cent compared with 1924.

"One of the most interesting applications of electric power in Texas has been in the oil producing and refining industry, which ranks second among the industries of the state. The demands of this service have been met by constructing new substations and transmission lines to the oil fields—Corsicana, Powell, Mexia, Wichita Falls, Burkburnett, Eastland and other places. In the Powell and Wichita Falls fields alone there are 775 wells being pumped electrically with a total connected load of 15,000 hp. One of the chief reasons for the use of electricity is its factor of safety around combustibles, and this factor has also asserted itself in the electrification of Texas gins."

The Texas Power & Light Company has nearly 2,000 miles of high-voltage transmission lines, Mr. Calder said. The company has generating stations at Trinidad, Waco, Paris, McKinney, Taylor, Temple, Palestine, Tyler and Gainesville. The total capacity of the seven generating stations is 90,000 kw.

Mapping routes of proposed electric power transmission lines and of completed lines by means of aërial photography is now a regular practice of the company. "More than 400 miles of such mapping has been done," Mr. Calder said, "and the mean error was less than 2 per cent. The photographs are usually made at an elevation of 8,400 ft., which produces photographs on a scale of about 700 ft. to the inch. Prints of the photographs are matched and placed on boards which represent 5-mile strips. After being matched, the route of the transmission line can be roughed in on the photograph by the use of a thread and pins."

Briefer News

Reports of Damage to Conowingo Dam Unfounded.—Newspaper reports that storm and flood on the Susquehanna River had done much damage to the preliminary work on the Conowingo Dam in Maryland and caused several workmen to lose their lives are declared untrue. No injury to the big construction job was caused.

Hagerstown (Md.) Citizens Sue Against Building New Municipal Plant.—Suit has been instituted in Maryland to bring about the revocation of the permission granted by the Maryland Public Service Commission to the Mayor and Council of Hagerstown to erect a new electric plant, to cost $300,000, involving a bond issue. Six citizens have joined with the Potomac Edison Company in bringing this suit.

Virginia Electric & Power's Growth.—The 50-mile transmission line that the Virginia Electric & Power Company has just completed between its Richmond and Fredericksburg plants went into operation on schedule time on Friday of last week. It is to begin operation at 66,000 volts, which ultimately will be raised to 110,000, and will obviate the lack of power in the Fredericksburg district that in previous years has accompanied low water in the Rappahannock River, as well as permit excess hydro power to be used in Richmond and places further south. Simultaneously with the opening of the new line announcement was made that the Westinghouse company will build the 30,000-kw. steam turbo-generator that, as previously announced, will be installed at Norfolk.

Site Acquired for Future Hydro Plant on Roanoke River.—Color has been given to long-standing reports that the Appalachian Power Company intends to build a large hydro-electric plant on the Roanoke River, on the Virginia-North Carolina boundary, by its reported recent purchase of a large tract of land in Vance County, N. C., bordering this river. No authentic information has, however, been given out concerning the size of the plant or how soon it will be constructed.

Activities of N.E.L.A. Commercial Cooking Committee.—In a commercial cooking school to be started next spring by the commercial cooking committee of the N.E.L.A. will be taught principles and methods of procedure, how equipment is operated, cost of operation and lay-out plans for hotels, clubs and bakeshops. Power companies throughout the country will be asked to select men to attend this school. The committee will send these students back home with as thorough a knowledge of commercial cooking as the time allotted will permit.

Trunk Line Across New Hampshire Will Soon Be in Operation.—The 88-mile high-tension line being built by the Insull interests across New Hampshire from Keene to Dover is approaching completion. The 26-mile section from Keene to the new Jackman hydro-electric plant at Hillsborough is already transmitting energy from the new station at Keene. On Nov. 5 the 20-mile section from the Jackman station to the Greggs Falls station of the Public Service Company of New Hampshire, just outside of Manchester, was completed, tested and found satisfactory.

Water Power on the Gaspé Peninsula in Quebec.—Water-power possibilities of the Gaspé peninsula, that portion of the Province of Quebec which lies south of the St. Lawrence River and east of the Matapedia River, are dealt with in a report just issued by the Natural Resources Intelligence Service of the Canadian government. The report says that these possibilities are of considerable local importance, but, compared with the large powers found in other parts of the province, they are relatively small. Nine rivers on the southern slope of the peninsula and five on the northern slope afford hydro sites. The existing installation amounts to 11,580 hp. This total is largely made up by the development of the Lower St. Lawrence Power Company at Price, on the Metis River, and those of the Cap Madeleine Pulp & Lumber Company at Grand Falls, on the Madeleine. There are 47 small plants in addition.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

American Society of Agricultural Engineers, Farm Power and Machinery Division—Chicago, Dec. 1 and 2. Raymond Olney, St. Joseph, Mich.

Pacific Coast Electrical Association—San Francisco, Dec. 2-3. S. H. Taylor, 447 Sutter St., San Francisco.

American Society of Mechanical Engineers—New York, Dec. 6-9. C. W. Rice, 29 West 39th St., New York.

National Electrical Credit Association—New York Division, Hotel Commodore, New York, Dec. 14; New England Division, Boston, Jan. 18. F. P. Vose, 1008 Marquette Bldg., Chicago.

American Engineering Council—The Mayflower, Washington, D. C., Jan. 13-15. L. W. Wallace, 26 Jackson Place, Washington.

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan. 17 and 18. F. D. Weber, Box 745, Portland.

National Electrical Manufacturers' Association (Supply Division)—New York, Jan. 17-21. F. Nicholas, 30 East 42d St., New York.

Western Association of Electrical Inspectors—Kansas City, Mo., Jan. 25-27. W. S. Boyd, 175 West Jackson Blvd., Chicago.

Artistic Lighting Equipment Association—Hollenden Hotel, Cleveland, Jan. 31-Feb. 5. G. P. Rogers, 424 Guarantee Title Bldg., Cleveland.

American Institute of Electrical Engineers—Midwinter convention, New York, Feb. 7-10; Southwestern District, Kansas City, March 17-18. F. L. Hutchinson, 36 West 39th St., New York.

Nearly Ten Thousand Acres of Public Land Reserved for Water Power in October.—Reservation by application of 9,599 acres of public land for water-power purposes in the States of California, Florida, Idaho, Nevada, Oregon and Wyoming was made during the month of October, according to a report of the Conservation Branch of the Geological Survey. The report shows that in addition 30,076 acres of public land in Utah and Washington were classified by the branch as valuable for water-power development, while 629 acres classified previously for this purpose were released.

Work on Caneadea (N. Y.) Dam to Begin at Once.—Orders were issued on Nov. 19 by Robert M. Searle, president of the Rochester (N. Y.) Gas & Electric Corporation, for beginning the construction of the power dam at Caneadea referred to two weeks ago. The first actual step will be building a highway from Gardenville bridge to Rushford, necessitated by plans to flood the old state highway. The dam will create a lake covering 800 acres, and the village of East Rushford will be wiped out. The work will not be finished for a year at least.

Utah Association to Study Colorado River Problem.—Believing that the proper development of the Colorado River can go ahead only after the entire West, and especially the states within the river basin, have reached a uniform decision on the matter, the Utah Associated Industries has undertaken a study of the development problems of the great stream. Letters in this connection have been sent to economists, reclamationists, public officials and business men in most of the states of the West by J. G. M. Barnes, president of the Utah Associated Industries.

Central-Station Power Papers at December A.S.M.E. Meeting. — Three papers are scheduled for the session on central-station power that will form part of the annual meeting of the American Society of Mechanical Engineers in New York, Dec. 6 to 9. This session will be held Thursday morning, Dec. 8, and the papers will be: "The Influence of Radiation in Coal-Fired Furnaces on Boiler Requirements and a Simplified Method for Its Calculation," W. J. Wohlenberg and E. L. Lindseth; "Operation Performance of Modern Surface Condensers," Paul A. Bancel, and "Some Results of Condenser Operation," Edwin B. Ricketts.

Work to Start on Guadalupe Dam.—Work is about to start on the first of the three dams which, as reported in the ELECTRICAL WORLD for Aug. 21 (page 394), the Texas Power Corporation is about to build on the Guadalupe River. The new company has taken over the holdings of the Guadalupe Water Power Company for $225,000, and its plans call for the expenditure of $2,500,000 in hydro-electric development on the Guadalupe. The first dam is to be built between McQueeny and New Braunfels; the second will be at McQueeny, 4 miles west of Seguin, and the third just below Seguin. The power developed will, it is thought, be sold principally to the Public Service Company of San Antonio.

Menominee River Hydro-Electric Plants.—Excellent progress is reported by the Northern Paper Mills Company on the construction of the two hydro-electric plants at Chalk Hills and White Rapids on the Menominee River which will be operated by its subsidiary, the Northern Electric Company. Completion of the plants is expected by May of next year. Both will be of the automatic-control type equipped with three generating units which will develop approximately 22,600 hp. and will cost in excess of $2,000,000. These plants will have a combined annual output of 66,000,000 kw.-hr. The entire output of the Chalk Hill plant has been contracted for by the Wisconsin Gas & Electric Company.

Transmission Extensions of Carolina Power & Light Company.—Interconnection at Danville, Va., between the transmission line of the Carolina Power & Light Company now being built northward from Roxboro, N. C., and the system of the Appalachian Power Company, which interconnection, according to P. A. Tillery, vice-president of the first-named company, is assured, will make a continuous series of high-tension lines reaching from the Great Lakes to Muscle Shoals. Another connecting link is being built between Kingsport, Tenn., and Waterville, Tenn., which will connect the Appalachian company with the Carolina Power & Light Company development in western North Carolina, where the Pigeon River plant is planned for construction next year. In eastern North Carolina the Carolina company is building a line between Rocky Mount and Battleboro, connecting at the latter place with the lines of the Virginia Electric Power Company which serve Richmond and Norfolk and part of northeastern North Carolina.

Fitkin Announces Completion of 766 Miles of New Transmission Line.—Engineers of the General Engineering & Management Corporation, operators of Fitkin Utilities, announce the recent construction of 766 miles of high-voltage transmission line in various states. The largest operation was in Michigan, where 537 miles of transmission line have been completed, stretching from Whitehall to Mackinaw City in the north and thence south to Grayling. Work further south connects the central stations at Ronceverte, in West Virginia, and Charlottesville, in Virginia, a distance of 129 miles. This is all steel-tower construction, the right-of-way touching a part of the Appalachians and crossing the Alleghany and Blue Ridge Mountain ranges. The generating stations at Ronceverte and Charlottesville hereafter will contribute the power required for this district, and the steam station at Staunton will be shut down and retained as a standby. A third major transmission line, not yet finished, will effect a tie-in between the central station at St. Petersburg, Fla., and that at Waycross, Ga., a distance of approximately 300 miles.

Hope Springs Eternal in the Gubernatorial Breast.—Governor W. P. G. Hunt of Arizona is attempting to arrange a conference of governors or proxies representing the seven Colorado River basin states at Needles, Cal., this month for the purpose of reaching a workable agreement in the controversy over that stream. Although previous conferences have failed to accomplish this purpose, Governor Hunt is said to believe that developments during the past six months may have helped to remove some of the sectional differences between the upper and lower basin states and to hope through the proposed conference to obviate federal intervention. The projected conferences between Arizona and the other states, it is rumored, will ignore the claims of the Arizona River Commission, an unofficial group which has represented the state in previous discussions.

Missouri Farms Using Electric Service Increase 70 per Cent in Two Years.—Missouri farms taking electric service from 119 established electric light and power systems increased from 2,207 in 1924 to 3,766 as of Oct. 1, 1926, according to a survey made by the Missouri Committee on Public Utility Information. On the latter date there were 1,072 miles of pole lines serving electrified farms. This was an increase of only 30 per cent, which appears to indicate that about 675 farmers who did not take service when the lines were constructed have done so since. Information from 41 other electric companies in the state was not secured, but the committee estimates that approximately 4,000 Missouri farms are now taking electric service from light and power systems. This is less than 2 per cent of all farms in the state.

Kenosha, Wis., and Waukegan, Ill., to Be Joined.—A new "superpower pool" will be formed through the interconnection of the generating properties of the Milwaukee Electric Railway & Light Company and those of the Public Service Company of Northern Illinois, according to announcement by President S. B. Way of the Milwaukee company. This will be done by constructing a 132,000-volt high-tension transmission line between Kenosha, Wis., and Waukegan, Ill. The portion of the line in Wisconsin will be built by the Milwaukee company and the portion in Illinois by the other company. The project will complete an interconnected chain of high-tension transmission lines covering the area from the North American company's hydro-electric plants in northern Michigan, through Milwaukee and northern Illinois, to large generating stations in Pennsylvania connected with Atlantic Coast power systems. The connection between Kenosha and Waukegan will, Mr. Way explains, permit the transfer, in cases of emergency only, of 45,000 kw. of power between the two systems.

Men of the Industry

Barry and Bragg Elected Vice-Presidents in Birmingham

J. M. Barry, manager of retail operations of the Alabama Power Company, has been elected vice-president in charge of retail operations, and Thomas Bragg, manager of the investment department, has been elected vice-president in charge of the investment department. Mr. Barry's affiliation with the Alabama Power Company dates back to 1918, when charge of the eastern division was given to him. Three years later he was appointed assistant chief engineer of the company, which position he occupied until 1923, when he became manager of the southern division of the company, with headquarters at Montgomery. The close of that year found Mr. Barry in Birmingham as manager of retail operations. His early engineering experience was obtained in the West, he having joined the Pacific Gas & Electric Company in 1910 immediately after graduation from the University of California. After two years he became electrical engineer for the Northwestern Electric Company at Portland, but in 1914 he severed his connection there to remove to San Francisco as chief of that city's department of electricity. Just prior to joining the Alabama Power Company Mr. Barry served as distribution engineer of the Great Western Power Company.

Mr. Bragg entered the employ of the Alabama Power Company in June, 1920, in the capacity of manager of the investment department. It was at that time that the officials of the company,

THOMAS BRAGG

President Martin and Vice-president Mitchell, having studied the advantages of customer ownership as proved by some of the country's largest utilities, decided to adopt the plan for the Alabama company. Mr. Bragg was selected to direct this work. He is a native of Camden, Ala., and a graduate of the Alabama Polytechnic Institute (Auburn), class of 1901, having received the degree of bachelor of science in chemistry and metallurgy and a master of science degree. From 1902 to 1920 he held the chair of chemistry at that institution. His promotion to a vice-presidency in the Alabama Power Company follows a record of unusual achievement as head of the investment department.

J. M. BARRY

Alex Dow, president of the Detroit Edison Company, will be the guest of honor at a dinner to be given at the Book-Cadillac Hotel in Detroit Dec. 4 by the engineering societies of that community in recognition of his many achievements in the engineering and business world.

Walter L. Mulligan, formerly vice-president, secretary and treasurer of the United Electric Light Company, Springfield, Mass., was unanimously elected president at a meeting of the directors. **Joseph F. Lyons**, formerly assistant treasurer of the company, has been promoted to the position of treasurer. **Alfred Leeds** was made vice-president and **James Gray** assistant treasurer. Mr. Mulligan is a graduate of Cornell University and has been with the company since 1898.

Philip H. Gadsden has resigned as president of the Charleston (S. C.) Consolidated Railway & Lighting Company, as part of a plan under which control of the company there will pass to the Southeastern Power & Light Company. Mr. Gadsden is a vice-president of the United Gas Improvement Company, Philadelphia. He was born at Charleston in 1867, was admitted to the bar in 1890 and practiced law in that city for more than fifteen years before he entered the public utility field. The United Gas Improvement Company, to the affairs of which Mr. Gadsden has lately been giving much of his time, was a large holder of stock of the company at Charleston.

Stuart M. Cooper has been elected president of the Charleston (S. C.) Consolidated Railway & Lighting Company to succeed Philip H. Gadsden under a plan by which ownership of the property at Charleston will pass to the Southeastern Power & Light Company. He has been first vice-president at Charleston. Mr. Cooper was graduated from Syracuse University as an electrical engineer. Early in his professional career he served as assistant engineer of the Syracuse Lighting Company. Later he was in turn assistant construction engineer, statistician and distribution engineer of the New York & Queens Electric Light & Power Company, operating on Long Island. He next became engineer of distribution of the Counties Gas & Electric Company, Norristown, Pa., and later assistant to the electrical engineer of the United Gas Improvement Company, an organization with many public utility holdings, among them the properties at Charleston which now pass to the Southeastern company.

J. F. Shaughnessy Heads Railroad and Utilities Commissioners

John F. Shaughnessy, since 1918 chairman of the Public Service Commission of Nevada, was elected president of the National Association of Railroad and Utilities Commissioners at the meeting held in Asheville, N. C., Nov. 9-12. Mr. Shaughnessy was appointed to the Nevada commission in 1907 and after eleven years of service was chosen chairman. He has been a strong proponent of state jurisdiction on the principle that it is beneficial to the utility to keep the regulatory jurisdiction close to the community served. Although appreciating the limitations imposed on busy transportation officials and the difficulties encountered in considering state lines, he has consistently maintained that general executives and attorneys of operating companies in the formation of general policies must consider the problems of the individual states served and must recognize state lines to the extent of so forming general policies as to take into consideration the interests and problems of the different states.

Mr. Shaughnessy was born in Oshkosh, Wis., in 1874 and was educated

J. F. SHAUGHNESSY

at the public schools and high school at Poynette, Wis. At an early age he entered the railway field first as a brakeman with the Chicago, Milwaukee & St. Paul Railway, later with the Fort Worth & Texas Railroad, and just prior to his connection with the Nevada commission he was identified with the Southern Pacific Railroad. Mr. Shaughnessy has been an active participant in the work of the National Association of Railroad and Utilities Commissioners, having served as second vice-president and first vice-president of that body.

George P. Berkey, vice-president and general manager of the Consolidated Water Power & Paper Company, Wisconsin Rapids, Wis., has resigned. Mr. Berkey had been connected with the company for eighteen years. **Issac P. Witter**, treasurer of the company, also resigned, because of ill health, following an association which covered a period of 25 years.

Nerias Henry has been appointed superintendent of distribution of the Edison Light & Power Company, York, Pa., having in charge all overhead lines. Mr. Henry, who entered the employ of the Edison company in 1908 as foreman of the meter department, was formerly affiliated with the testing department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, and with the United Electric Light & Power Company, New York, in the capacity of meter superintendent.

Ray Carr, district manager of the Public Service Company of Northern Illinois at Lacon since February, 1925, has been appointed to succeed George S. Bartlett as district manager in Pontiac. Mr. Carr's connection with the company dates back to 1913, when he started in as troubleman with the District "O" line crew at Morris, later becoming district line foreman and then assistant district superintendent. Mr. Carr is thoroughly acquainted with the Pontiac region as a result of his earlier service with the company.

Obituary

Robert J. Rosenfeldt, senior vice-president of the W. B. Foshay Company, Minneapolis, and one of the business leaders of the Northwest, died suddenly Nov. 18. Mr. Rosenfeldt was born April 18, 1858, in Plymouth, Wis. He joined the Foshay organization in 1919 and was made vice-president four years ago.

Robert W. Day, president of the United Electric Light Company, Springfield, Mass., whose death in that city on Nov. 18 was briefly noted in last week's issue, was a pioneer among New England central-station executives and a citizen of wide influence in the central Connecticut valley. Mr. Day was born at Springfield in 1852. A large part of his life was occupied in the envelope-manufacturing industry, and at the time of his death he was first vice-president of the United States Envelope Company and president of the Indian Orchard Company, a textile-making establishment. He became president of the United Electric Light Company in 1903. His personal relations with employees were friendly in an unusual degree, and his interest in maintaining physical plant at high standards was influential in making the United company one of the most notable in New England in this respect. In commenting upon his career, the Springfield *Union* declared him "a valuable factor in the progress of Springfield" and "a fine type of citizen, proud of his native city and keenly interested in its progress and in the maintenance of its best traditions."

Recent Court Decisions

"Spot Reproduction Costs" Upheld as Rate-Making Basis by Supreme Court. —Maintaining that a public utility corporation is entitled to charge rates which will allow it to earn 7 per cent on its "spot reproduction value," the United States Supreme Court has just found that the valuation for rate-making purposes fixed by the Indiana Public Service Commission on the property of the Indianapolis Water Company is too low, and has sustained an injunction against the enforcement of the rates granted by a lower United States court and based on the issue of confiscation. The commission did not give full consideration to "spot reproduction costs," the Supreme Court holds, and therefore the rates ordered would on a true valuation bring less than the percentage named. "It is true," said the Supreme Court, "that if the tendency or trend of prices is not definitely upward or downward and it does not appear probable that there will be a substantial change of prices, then the present value of land plus the present cost of construction of plant, less depreciation if any, is a fair measure of the value of the physical elements of the property." Justices Brandeis and Stone filed a dissenting opinion, declaring the case should have been sent back to the lower court for further proceedings. Justice Brandeis also declared that "spot reproduction prices," which, he said, could not be arrived at without the aid of Aladdin's lamp, should not be the basis of estimating value, but that average prices over a course of years should be taken. He also reiterated his position that "too great emphasis" is placed on the 7 per cent return feature of such cases.

Taxation of Franchises in Missouri.— Holding, in State ex rel. Union Electric Light & Power Company vs. Gehner, that under the statutes of Missouri the city of St. Louis had no power to assess for taxation the franchises of public utilities within the city, but that this power is vested in the state tax commission, and quoting from the law to establish this assertion, the Missouri Supreme Court went on to say: "These sections would seem conclusively to settle the question of where the power to assess the franchises of electric power and light companies and electric transmission lines is lodged. But respondents say that the basis of the assessment of the property and franchise of a railroad company is the sworn statement of its president or other chief officer in which is set forth the length of the road, the length of the double and side tracks, the number of engines and cars of all kinds and descriptions used by them, and that as electric light and power companies and electric transmission lines have no such property, it is impossible for them to render statements of their property 'in like manner as the president or other chief officer of the railroad company is . . . required to render for the taxation of railroad property.' Their argument seems to be that, while the statute invests the state tax commission with power to assess franchises of such companies as relators, it prescribes no method, or an impossible method, for it to follow in making the assessments, hence the power must be exercised by the local assessor. The conclusion is a *non sequitur*. The sole power to assess the franchises in question is by the statute conferred upon the state tax commission; if the manner of making the assessments as prescribed by the law can by no possibility be conformed to, then no tax can be levied." (286 S. W. 117.)*

Commission Rulings

Return of Lamps Furnished by Central-Station Company. — The Illinois Commerce Commission decided in settling a complaint brought by the N. Shure Company against the Commonwealth Edison Company that an electric company loaning lamps to a consumer under a schedule providing for lamp service is entitled to the return of the lamps on demand when the consumer changes to a schedule that has no provision for lamp service.

Commission Refuses Immediate Rate Reduction Where Small Consumers Are Served at a Loss and Heavy Expenditures Are Contemplated. — The New York Public Service Commission, denying the petition of the city of Elmira for an immediate reduction of the electric rates of the Elmira Water, Light & Railroad Company, pending a study of certain optional rates filed by the company, said: "The company's exhibit shows that under the present rates small lighting consumers are served at a loss, and it is apparent that any excess of earnings shown by the company as a result of the 1925 operations must have resulted from its power rates and its special contracts with large consumers. It also appears that the company has little or no reserve electrical plant and that its present plant is constantly used to capacity, which also in part accounts for the apparently high electrical net revenues shown. The company has already taken steps to extend its plant to take care properly of its growing business and will be obliged to install a new generator, boilers and other accessories as well as erect extensions to buildings to house the same. It also contemplates the construction of a transmission line to reach Niagara power. This program calls for capital expenditures of approximately $2,000,000. Under the peculiar conditions here existing the commission is of the opinion that the best interests of the community would be served by reserving a decision on the electric rates until a study of the optional rates referred to can be made."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Financial and Corporate

Utility Stocks Recede

Power and Light Securities Weaken Marginally—Losses Exceed Gains—Few Notable Advances

THE markets for public utility securities did not share the sudden upturn which occurred this week in a large range of individual stocks. Selling orders, on the other hand, have dominated, and there were more declines than rises in the prices of power and light stocks.

Among the common issues there were a large number of marginal recessions in the more substantial stocks. American Gas & Electric lost about three points, from 107⅛ to 104⅜. Brooklyn Edison, Middle West Utilities, Northeastern Power and Pacific Gas & Electric were also weaker. Public Service of New Jersey, Edison Electric of Boston and American Light & Traction made advances, the latter gaining four points to 219. The feature rise of the week was that of the Philadelphia Company, which registered a gain of twelve points, from 77 to 89. This latter advance was attributed to the capital readjustment operations of Standard Gas & Electric, of which the Philadelphia Company is a subsidiary. Since more than 95 per cent of the latter company's stock outstanding is owned or controlled by the parent company, the floating volume of stock is small and few purchases or sales are necessary to alter quotations.

Public utility bonds continue in active demand, and the volume of new issues has been heavier recently than usual. Prices are substantially as during the past two or three weeks. Earnings of the utility companies continue to expand month by month. Gross earnings just announced for September were $135,600,000 and operating costs $60,500,000, leaving a net of $75,000,000 against $61,300,000 for September of last year.

New England Power Stockholders to Meet.—A special meeting of the stockholders of the New England Power Association has been called for Dec. 3 for the purpose of authorizing the issuance of 500,000 additional shares of common stock and 200,000 shares of preferred stock.

Power Corporation Issues First Report.—The Power Corporation of Canada, Ltd., has issued its first annual report, covering the twelve months up to June 20, 1926. That the corporation has made a creditable beginning in the matter of earnings is indicated by the profit and loss statement, which shows that after paying dividends on the first preference shares a substantial amount was carried to surplus. Among the new services which it will conduct this year are management contracts with East Kootenay Power, Ottawa & Hull Power, Ottawa River Power, Ottawa-Montreal Power & Transmission and Canada Northern Power. The statement shows that the combined gross earnings of the various companies for the last fiscal period were $12,974,984, with net earnings for the same period available for reserves and common dividends of $1,891,703. The total kilowatt-hours generated during 1925 by these companies was 850,000,000, the total installed plant capacity being 400,000 hp., with an ultimate capacity of 600,000 hp.

Adirondack Company Increases Capital Stock.—The Adirondack Power & Light Corporation, Schenectady, has filed a certificate in the office of the Secretary of State of New York authorizing an addition to its present capital stock of 100,000 shares of no par value, the present stock, exclusive of the increase, consisting of 240,00 shares of common stock, $50 par value; 150,000 shares of 7 per cent preferred, $100 par value, and 30,000 shares of 8 per cent preferred, $100 par value.

Big Step Toward Capital Simplification

Arkansas Power & Light Company Has Taken Over Large Group of Utilities in Western States—Consolidation to Be Effected with Minimum of Complication

By H. M. CAMERON
Financial Editor ELECTRICAL WORLD

THE Electric Bond & Share Corporation has just announced the completion of one of the outstanding current examples of capital structure simplification. In accordance with the company's usual policy of keeping the capital of affiliated companies as simple as possible, plans have been completed to merge a group of Arkansas utilities under the Arkansas Power & Light Company. The merger is physical as well as financial, since nearly all of the communities to be served by the new company are interconnected or will be interconnected in the near future by a transmission system about 1,300 miles in length. The too common evils of a complex and bewildering maze of interrelated companies, inducing public criticism and confusing the investor, are avoided. Existing issues are retired in favor of the new parent-company securities in the simple form of a covering bond issue and well-proportioned amounts of preferred and common stock.

The first step in the program thus briefly outlined was the formation recently of the Arkansas Power & Light Company. The intent was that this company should absorb the groups named below and thus secure the advantages of interconnection, making provision at the same time for the future electrical needs of the state under advantageous financial conditions. The constituent companies include Arkansas Light & Power, Arkansas Central Power, Pine Bluff Company, East Arkansas Power & Light and some smaller companies scattered throughout the state. In addition, the company is to acquire certain transmission lines and other electric properties now in operation or under construction and owned by the Electric Light & Power Corporation or its nominees. The companies entering the merger are controlled by the Electric Power & Light Corporation, and under the merger plan this company will control the Arkansas Power & Light Com-

Old Plan

	Common	Preferred	Bonds
Arkansas L. & P. —	38,000 sh.	40,947 sh.	$60,000 Russellville W. & L. 1st 6s 3,799,300 Arkansas L. & P. 1st 6s 3,321,100 Arkansas L. & P. 1st and ref. 6s
Arkansas Central P.—	150,000 sh.	11,789 sh. $7 cum. pref.	$992,000 Little Rock R. & E. 1st 5s 1,018,500 Little Rock R. & E. ref. 6s 3,500,000 Ark. Central P. 1st lien and ref. 6s
Pine Bluff Co. —	$1,000,000	$1,000,000 7% cum. pref.	$678,000 Pine Bluff Co. 1st 5s 1,121,000 Pine Bluff Co. 1st 6s
East Ark. P. & L. —			No issues in hands of public
Smaller Companies —			No issues in hands of public

New Plan

	Common Issue	$7 pref. issue	1st and ref. mortgage bonds
Arkansas P. & L. Co.—			Little Rock R. & E. 1st 5s Little Rock ref. 6s

SIMPLE STRUCTURE RESULTS FROM RETIREMENT OF SUBSIDIARY COMPANY ISSUES

pany. Thus future electrical needs of a large part of the state will be taken care of by one big organization whose corporate structure has been carefully and scientifically set up and with adequate facilities for future expansion according to requirements.

Requisite in any corporate simplification program is the retirement of the miscellany of existing obligations where possible. In order to carry out the present merger and permit the creation of a new mortgage the terms of which will meet modern concepts of what utility mortgages should be, all the outstanding bonds in constituent companies subject to call have been called for redemption. Unfortunately there are outstanding with the public two small issues aggregating about two million dollars which cannot be called. This necessitates the issue of new first and refunding mortgage bonds instead of straight first mortgage bonds, which would have been the most desirable. Approximately $12,500,000 in bonds, consisting of five separate issues, have been called for payment, and the new company will thus be in a position to issue a substantial amount of bonds against the property owned. The indenture securing the bonds will be of the new type, permitting bonds to be issued in series, each series to bear such rate of interest, to mature on such date, to be redeemable on such terms and to contain such other rights, limitations and provisions as the board of directors of the company may determine. This places the company in a position to finance at any time, on a basis permitted by the then existing financial situation.

TO EXCHANGE OUTSTANDING STOCK

In addition to the consolidation of obligations of the constituent companies, the merger provides that the existing seven-dollar or 7 per cent preferred stock of the respective companies is to be exchanged, share for share, for the seven-dollar preferred stock of the new company. In this way the company will begin its existence with a capitalization consisting of only the two underlying issues of bonds, first and refunding mortgage bonds, preferred stock and common stock. All of the common stock will be owned by the Electric Power & Light Corporation.

This extremely simple arrangement replaces a complex group of securities issued under the auspices of the various constituent companies. In the case of the Arkansas Light & Power Company, for example, capital stock outstanding was represented by 40,947 shares of preferred stock and 38,000 shares of common. The bonded debt of that company, consisting of three separate issues, amounts to something over seven million dollars, in the hands of the public. The Arkansas Central Power Company has stock outstanding consisting of 11,789 shares of preferred and 150,000 shares of common. The bonded debt of about $5,500,000, in the hands of the public, consists of three separate issues. Similarly, the other companies have several outstanding issues of varying maturities.

Thus consolidation and interconnection are being effected without the complications formerly attending such development. Simplification is being carried out in connection with, rather than subsequent to, the process of unification.

Austrian Company Reports Earnings. —Net earnings of the Lower Austrian Hydro-Electric Company after expenses but before interest for the eight months

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Monday Nov. 22	Low 1926	High 1926
ABITIBI PWR. & PAPER, com. —no par	90¾	70¼	98
Adirondack Pwr. & Lt.—7% pf.	103	....	....
Adirondack Pwr. & Lt.—8% pf.	111	....	....
Ala. Pwr., pf.	107¼	....	....
Allis-Chalmers Mfg. pf.	k109¼	105	110¼
Allis-Chalmers Mfg., com.	86½	78¼	94¼
Aluminum Co. of Amer., com.	70	....	....
Aluminum Co. of Amer. pf.	102	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	83¼	79	98
Amer. & Foreign Pwr., com.—no par	17¾	14¼	42¼
Amer. Bosch Magneto, com—no par	k 17½	16	34¼
Amer. Brown Boveri, Elec.	40	30¼	50
Amer. Brown Boveri, Elec., pf.	k 96	86¼	97¼
Amer. Gas & Elec., 6% pf.—no par.	96½	90¼	96¼
Amer. Gas & Elec., com.—no par.	105	64	110¼
Amer. Lt. & Trac., 6% pf.	120	105	124
Amer. Lt. & Trac., com.	219	193	263
Amer. Pwr. & Lt., 6% pf.	98¼	92	99¼
Amer. Pwr. & Lt., com.—no par.	m 66¾	50¼	72
Amer. Pub. Serv., 7% pf.	a 97½	....	....
Amer. Pub. Serv., com.	50	45	80
Amer. Pub. Utilities, 6% pf.	77	....	....
Amer. Pub. Utilities, 7% pf.	88	....	....
Amer. Pub. Utilities, com.	66	....	....
Amer. States Sec., A	2¼	....	....
Amer. States Sec. B	2¼	....	....
Amer. Superp wr., pf.—25	k 26¼	23	26¼
Amer. Superp ower, pf.	l 94	....	....
Amer. Superpwr., Class A—no par.	k 28¾	19¼	37¼
Amer. Superpwr., Class B—no par.	k 29½	21¼	39
Amer. Wtr. Wks. & Elec., 7% pf.	102½	101¼	108¼
Amer. Wtr. Wks. & Elec., com.—20.	56¼	48¼	74
Anaconda Copper	48¼	41¼	51¼
Appalachian Elec. Pwr., 7% pf.	98	90	101
Appalachian Ele . Pwr., 1st pf., 7%.	98	99	102
Appalachian Elec. Pwr., com.	m 78	....	....
Arizona Pwr., 7% pf.	76¼	....	....
Arizona Pwr., com.	22	....	....
Arkansas Cent. Pwr., pf., $7—no par	k101	99	107
Arkansas Lt. & Pwr., 7% pf.—no par	101	....	....
Arkansas Lt. & Pwr., com.—no par	100	110	115
Asheville Pwr. & Lt., 7% pf.—no par	107½	100¼	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	83	....	....
Assoc. Gas & Elec., Class A—no par	34¼	25¼	38¼
BABCOCK & WILCOX, com.	116¼	....	....
Binghamton Lt., Ht. & Pwr., pf.	91	90	95
Birmingham Elec. pf.—$7—no par.	105	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50.	k100	100¼	106
Blaw-Knox, com.	l 74	....	....
Brazilian Trac., Lt. & Pwr., com.	f104	....	....
Broad River Pwr., pf.	94	....	....
Brooklyn Edison, com.	157½	133	163
Buffalo, Niagara&East.Pwr.,pf.—25.	l 25¼	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par.	l 30¼	....	....
CALIFORNIA ELEC. GENERATING, pf.	93	89	95
California Ry. & Pwr., pf.	130	88	130
Carolina Pwr. & Lt., pf.—$7—no par	107½	....	....
Cent. & S. W. Ut. 7% pf.—no par	a 92¼	....	....
Cent. & S. W. Ut., pr. ln. pf.—no par	a 99	....	....
Central Ariz. Lt. & Pwr., pf.	105	....	....
Central Ark. Ry. & Lt., 7% pf.	99	....	....
Central Ill. Pub. Serv., 6% pf.	a 88¼	....	....
Central Ind. Pwr., 7% pf.	86	84¼	93¼
Central Pwr. & Lt., pf.	99	....	....
Central States Elec., 7% pf.	92	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	m117	110	117
Chicago Fuse Mfg., com., no par.	a 32	30	35
Cincinnati Gas & Elec., com.	g 92¼	....	....
Cities Service, 6% pf.	l 92½	86¼	92½
Cities Service, pf.B—10.	l 81	71	81
Cities Service, pf. BB—100.	l 82¼	74	82¼
Cities Service, com.—20.	l 49¼	37¼	49¼
Cities Service, Bks. Shrs.—10.	l 24¼	19¼	24¼
Clarion River Pwr., pf.	95	93	95
Cleveland Elec. Illg., 6% pf.	107½	....	....
Cleveland Elec. Illg., com.	296	....	....
Colorado Pwr., 7% pf.	k 95	96	97
Columbia Gas & Elec., 7% pf.	116¼	111¼	116¼
Columbia Gas & E., com.—no par.	87½	63¼	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104½	....	....
Columbus Elec. & Pwr., new com.	50	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	99¾	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93	....	....
Col. Ry., Pwr. & Lt., com.—no par.	69	....	....
Commonwealth Edison, com.	a137	....	....
Commonwealth Pwr., 6% pf.	91	82	91¼
Commonwealth Pwr., com—no par.	41½	28¼	43½
Conn. Lt. & Pwr., 8% pf.	117	....	....
Conn. Lt. & Pwr., 7% pf.	109	....	....
Cons. Gas of N. Y., pf.—50.	59¼	....	....
Cons. Gas of N.Y., com.—no par.	109¼	87	115¾
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	k105	102	105
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½ % pf.	e111½	....	....
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e113	....	....
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e126¼	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e 52½	....	....
Cons. Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	97½	....	....
Consumers Pwr., 6.6% pf.	103	....	....
Continental Gas & Elec., 7% pfc. pf.	103	....	....
Continental Gas & Elec., 7% pr. pf.	98	....	....
Continental G.&E., com.—no par.	k185	....	....
Crocker Wheeler, com.	22	....	....
Crocker Wheeler, pf.	60	....	....
DALLAS PWR. & LT., 7% pf.	108½	....	....
Dayton Pwr. & Lt., 6% pf.	100	....	....
Detroit Edison, com.	134½	123½	141½
Dubilier Condenser com.—no par.	6½	3¼	11
Dubuque Elec., 6% pf.	94	93	98½
Duquesne Lt., 7% pf.	115½	111½	116¼
EAST, N. Y. UTIL. pf.	101	80	104
Eastern New York Util., com.	65	70	75
Eastern States Power.	12	....	....
Eastern States Power, pf.	91	....	....
Eastern Tex. Elec., 7% pf.	105	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	d223	....	....
E. Paso Elec., com.—no par.	70	70	9¼
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	l106	103¼	109¼
E. Bd. & Share Sec., com.—no par.	l 67	56¼	86
El. Household Util.	a 16¼	....	....
Elec. Investors, 6% pf.—no par.	93	....	....
Elec. Investors, com.—no par.	39¼	30¼	74¼
Elec. Investors, 10% pd. receipts.	25	12	56
Elec. Pwr. & Lt., ctfs, pf.	k 95¼	89¼	98¼
Elec. Pwr. & Lt., ctfs., 40% pd.	k103	99¼	115
Elec. Pwr. & Lt., ctfs. full pd.	k102½	102¼	110¼
Elec. Pwr. & Lt., ctfs., com—no par.	17¾	15¼	34¼
Elec. Refrig.	39	39	78¼
Elec. Ry. Securities, com.—no par.	k 5¼	4¼	10
Elec. Storage Battery, com.—no par.	83¼	71¼	94¼
Elmira Wtr., Lt. & R. R., 7% pf.	99	97½	99½
Emerson Elec., pf.	m101	100	104¼
Empire Dist. Elec., 6% pf.	l 90	82	90
Empire Power, A	26½	....	....
Engr. Pub. Serv., pf.—no par.	m 94	92¼	96½
Engr. Pub. Serv., com.—no par.	22¼	19¼	24¼
Eureka Vac. Cleaner, com.—no par.	59½	43	59½
FAIRBANKS MORSE, pf.	k106½	108	115
Fairbanks Morse, com.—no par	42¾	40¼	59½
Federal Lt. & Trac., com.	43¾	28	43¾
Federal Light & Traction, pf.	k 87½	86	91½
Federal Utilities, pf.	m 70	....	....
Federal Utilities, com.	m 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l108½	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	61	....	....
Galveston-Hstn. El., com.	21	....	....
Gen. Elec., com.	85½	79	95½
Gen. Elec., special—10.	11¼	11	11¾
Gen. G.&E., (Del.) com. A no par.	k 40	34	59
Gen. G.&E., (Del.) com. B no par.	m 37¼	36	48¾
Gen. G.&E., (Del.) A pf. $8 no par.	k111	105½	113
Gen. G.&E., (Del.) A pf. $7 no par.	k 98¼	95	99¼
Gen. G.&E., (Del.) pf. B.	k 93	92¼	96
General Public Service, pf.	m103	100	106
General Public Service, com.	k 11	11¼	16¼
Ga. Lt., Pwr., & Rys., 6% pf.	90	82	98
Ga. Lt., Pwr. & Rys., com.	m 60	65	80
Ga. Ry. & Pow er, 8% pf.	k114	112	114
Ga. Ry. & Pow er, 7% pf.	106	....	....
Ga. Ry. & Pwr., 4% pf.	m114	....	....
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h102	....	....
IDAHO PWR., 7% pf.	102½	....	....
Ill. No. Utilities, 6% pf.	k 88	88	92
Ill. Pwr. & Lt., 7% pf.	99	....	....
Ingersoll Rand	k 95	80¼	101
Int. Combus. Engr., com.—no par	41¼	33¼	64¼
Int. Utilities, class A—no par.	k 29	25	39
Int. Utilities, class B—no par.	4	3¼	9¼
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	98	96¼	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	97	....	....
Jersey Central Pwr. & Lt., ptc., pf.	108	95¼	112
Jersey Central Pwr. & Lt., com.—no par.	k 25	25	50
Johns-Manville, com.—no par.	169	130	169

Stock Exchange: eChicago; hSt. Louis; ePhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Nov. 20. lBid, low, high, Tuesday, Nov. 23. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Monday Nov. 22	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	k112	107½	113½
Kansas Gas & Elec., 7% pf.	l103½	99	103½
Kentucky Hydro-Elec., pf.	m 93½	91½	95½
Kentucky Sec., 6% pf.	81[a]	....	....
Kentucky Sec. com.	101	....	....
Kentucky Utilities, 6% pf.	94	90	95
Keystone Pwr. & Lt. 7% pf.	96	95	97
LA CLEDE GAS LT., com.	168	146	175½
Lehigh Pwr. Sec., com.—no par	16½	10	22
Long Island Ltg., 7% pf.	109	....	....
Long Island Ltg., com.—no par	130	120	150
Los Angeles Gas & Elec., 6% pf.	98	....	....
Louisville Gas & Elec., Class. A	24½	22½	26½
MANHATTAN ELEC. SUPPLY.	51½	44	87½
Manila Elec., com.—no par	k 41	27½	45½
Maytag Mfg., com.	k 22½	19	24½
Memphis Pwr. & Lt., pf., $7, no par	107	103	109
Metro. Edison, pf.—$6—no par	93½	....	....
Metropolitan Edison, pf., $7, no par.	104	....	....
Metropolitan Edison, com., no par.	55	45	55
Middle West Utilities, 7% pf.	a105	97½	111½
Middle West Utilities, 7% pr. lien pf.	a115½	....	....
Middle West Utilities, com.—no par.	a111	....	....
Midland Utilities, pr. ln. pf.	a 99½	....	....
Midland Utilities pf. A	a 98	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	101	....	....
Milwaukee Elec. Ry. & Lt., 6% pf.	97	....	....
Minn. Pwr. & Lt., 7% pf.	l104½	100	104½
Miss. Pwr. & Lt., pf.	105½	....	....
Miss. River Pwr., 6% pf.	94½	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7 no par.	103½	....	....
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	100	....	....
Mohawk Hudson Pwr., com.—no par	24	20½	28½
Montana Pwr., pf.	m117½	112½	119½
Montana Pwr., com.	83½	69½	86½
Montreal Pwr., com.	f 72½	....	....
Mountain States Pwr. pf.	96	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	99	....	....
National Carbon, pf.	a125	124	128
National Electric Pwr-A.	a 22½	....	....
National Elec. Pwr., pf.	m 93½	92	96½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	102½	96	102
National Pwr. & Lt., com.—no par.	20½	16½	38½
National Pub. Serv., 7% pf.	89	....	....
National Pub. Serv., pte. pf.	108	....	....
National Pub. Serv., A com.—no par.	k 19½	15½	24
National Pub. Serv., B com.—no par.	k 14½	10	16½
Nebraska Pwr., 7% pf.	l107½	103	107½
Nevada-Calif., Elec., com.	m 20	18½	44½
New Brunswick Pwr., pf.	58	30	60
New England Pub. Serv., pr. ln. pf.	99	98	99½
New England Pub. Serv., pf.	93	95½	97
N. J. Pwr. & Lt., 7% pf.	109½	104	110
New Orleans Pub. Serv., 7% pf.	103½	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	....	....
N. Y. Central Elec., 7% pf.	98½	98½	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25	28½	27½	29½
Niagara, Lock. & Ont. Pwr., 7% pf.	109	110	111½
No. Amer., 6% pf.—50	k 51	49	52½
No. Amer., com.—10	50	42	67
No. Amer. Edison pf.—no par	96	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	93	....	....
Northeastern Pwr., com.	18½	15½	36½
No. Indiana Gas & Elec., pf. A.	101	98	103½
No. Indiana Public Service — pf.	101	....	103½
No. N. Y. Utilities, 7% pf.	103	....	....
No. Ohio Pwr., com.—no par	12½	11	26½
No. Ohio Trac. & Lt., 6% pf.	78	78	81
No. Ohio Trac. & Lt., 7% pf.	92	88	96
No. Ont. Lt. & Pwr., pf.	83	....	....
No. Ont. Lt. & Pwr., com.	73	....	....
No. States Pwr., 7% pf.	101½	....	....
No. States Pwr. com.	107½	97	136½
No. Texas Elec., 6% pf.	52	....	....
No. Texas Elec., com.	17	....	....
OHIO BRASS, com. B—no par	76	70	80
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	94	40	95
Ohio Pwr., 6% pf.	96½	60	96
Ohio Pub. Serv., 6% pf.	l 94½	90	96½
Ohio Pub. Serv., 7% pf.	l103½	96	104
Ohio River Edison, pf.	103	....	....
Oklahoma Gas & Elec., pf.	96	....	....
PACIFIC GAS & ELEC., 6% pf.	98	....	....
Pacific Gas & Elec. com.	k128½	118	133½
Pacific Pwr. & Lt., 7% pf.	102	....	....
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt. & Pwr., pf.—no par	c 73	70½	91
Penn-Ohio Edison, 7% pf.	95	....	....
Penn-Ohio Elec., 7% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	98	94	97
Penn-Ohio Pwr., & Lt., 8% pf.	108	100	109
Penn Pwr. & Lt.—$7—no par.	l107½	103	108½
Penn Pub. Serv., 7% pf.	103	96	103
Penn Pub. Serv., 6% pf.	87	85	90
Penn Wtr. & Pwr., com.	e171	141	171
Phila. Co., 6% pf.—50	50½	45	51½
Phila. Co., com.—50	89	59½	89
Phila. Elec., com.—25	c 50½	....	....
Pittsburgh Utilities, pf.—10	m 19½	14½	20½
Portland Elec. Pwr., 7% pf.	97	....	....
Portland Elec. Pwr., 6% pf.	83	....	....
Portland Elec. Pwr., 6% 2nd pf.	70	....	....
Portland Elec. Pwr., com.	28	....	....
Potomac Elec. Pwr., pf.	l107½	....	....
Pwr. Corp. of N.Y., com—no par.	m 79	77½	90½
Pwr. Sec., pf.—no par.	k 24	10	29
Pwr. Sec., com.—no par	k 6	4	13
Pub. Serv. of Colorado 7% pf.	l 99	96	100
Pub. Serv. of N. J., 7% pf.	110	103½	110
Pub. Serv. of N. J., 8% pf.	k124	115	124½
Pub. Serv. of N. J., com.—no par.	33½	31½	33½
Pub. Serv. of No. Ill., 6% pf.	a101	....	....
Public Serv. of No. Ill., 7% pf.	a114	....	....
Pub. Serv. of No. Ill., com.—no par	a129	127	140
Pub. Serv. of No. Ill., com.	a129	128	143
Pub. Serv. of Okla., 7% pf.	98	92	100
Pub. Serv. Elec. & Gas, 6% pf.	k102½	97	104½
Public Service Elec. Pwr., pf.	113½	106	114
Puget Sound Pwr. & Lt., 7% pf.	103	....	....
Puget Sound Pwr. & Lt., 6% pf.	83	....	....
Puget Sound Pwr., & Lt., com.	29½	26	66½
RADIO CORP. OF AM., pf.—50	51½	44½	51½
Radio Corp. of Amer., com.—no par.	61½	32	61½
Republic Ry. & Lt., pf.	115	....	....
Republic Ry. & Lt., com.	92	....	....
Rochester Gas & Elec., 5% pf.	m 95	80	98
Rochester Gas & Elec., 6% pf.	k 95	80	98
Rochester Gas & Elec., 7% pf.	104	105	107
SAN JOAQUIN LT. & PWR., 7% pf.	106	97½	108
Safety Cable, com.	53	42½	55½
St. Joseph Ry., Lt., Ht. & Pwr., pf.	67	60	70
Servel Corp.	12½	11½	22½
Sierra Pacific Elec., com.	24	....	....
Sioux City Gas & Elec., 7% pf.	98½	....	....
S. E. Pwr. & Lt., pf.—$7—no par.	l101	....	....
Southeastern Pwr. & Lt., pfc. pf.	l 67½	....	....
S. E. Pwr. & Lt., com.—no par.	33½	20	48½
So. Calif. Edison, 8% pf.—25	32	32½	33½
So. Calif. Edison, 7% pf.—25	k 27½	27½	28½
So. Calif. Edison, 6% pf.—25	k 24½	24½	25½
So. Calif. Edison, com.	31	30½	33
Southern Cities Utilities, 7% pf.	87	....	....
Southern Cities Utilities, com.	36½	28	49
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B.	60	....	....
Southwestern Lt. & Pwr., $6 pf.	82	....	....
Southwestern Pwr. & Lt., 7% pf.	k102½	100	105
Springfield (Mo.) Ry & Lt., 7% pf.	97	95	100
Standard Gas & Elec., 8% pf.	56½	53½	57½
Standard Gas & Elec., 7% pf.	102½	....	....
Standard Gas & Elec., com.—no par.	54½	51	69
Standard Pwr. & Lt., 7% pf.	96½	....	....
Staten Island Edison, pf.—$6—no par	96	....	....
Superheater, com.—no par.	154	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com.	340	260	358
TAMPA ELEC., com.	k 47	45½	67
Tenn. Elec. Pwr., 6% pf.	91	....	....
Tenn. Elec. Pwr., 7% pf.	103	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	l 107½	102	107½
Tide Water Pwr., 7% pf.	95	....	....
Timken Roller Bearing, com—no par	82½	44½	85½
Toledo Edison, 8% pf.	l114	111	114
Toledo Edison, 7% pf.	l103	101	103
Toledo Edison, 6% pf.	l 94½	90	95
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	87½	90
UNITED GAS & ELEC., 6% pf.	98	....	....
United Gas & Elec., com.—no par.	m 57	56	66
United Gas & Elec. (N.J.), 5% pf.	71	....	....
United Gas Impr.—50	c112½	84½	144½
United Lt. & Pwr. pf.—$4—no par.	a 50½	44	51
United L. & P. pf.—$6.50—no par.	87½	85	88½
United Lt. & Pwr., com., A—no par	14½	10½	28
United Lt. & Pwr., com., B—no par	m 13½	15	31
Utah Pwr. & Lt., 7% pf.	l 103	99	103½
Utica Gas & Elec., 7% pf.	104	....	....
Utica Gas & Elec., com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A	m 30½	26½	37
Utilities Pwr. & Lt., com. B—no par	13½	13½	18½
VERMONT HYDRO - ELEC., 7% pf.	95½	94	96
Virginia Elec. & Pwr., 7% pf.	104	101	105
Virginia Pwr., 7% pf.	108	103	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	b 70	67½	85
Wagner Elec., com.—no par.	b 19½	13½	34½
Washington Ry. & Elec., com.	j103	....	....
Washington Ry. & Elec., pf.	j 89½	....	....
Washington Wtr. Pwr., com.	133	130	136
West Mo. Pwr., 7% pf.	m 92	....	....
West Penn., 7% pf.	m113½	108	115
West Penn, com.	m125	118	130
West Penn Elec., pf.	k 99	95½	101
West Penn Elec., Class A.	k 95	88½	98½
West Penn Pwr., 6% pf.	k113	108	115
West Va. Lt., Ht. & Pwr., 7% pf.	94½	95	98
West Va. Utilities 7% pf.—50	48½	43	51
Western Pwr., 7% pf.	97½	91½	99
Western States Gas & Elec., 7% pf.	93	....	....
Western States Gas & Elec., com.	17	....	....
Westinghouse El. & Mfg., com—50	68½	65	79½
Weston Elec. Instrument, Class A.	k 32	27½	33½
Weston Elec. Instrument, com.	k 16½	13½	19½
Wheeling Elec., pf.	95	91	97
Wis. Pwr., Lt. & Ht., 7% pf	k 95	85	90
Worthington Pump, pf. A.	k 45	51	80
Worthington Pump, pf. B.	38½	38½	65
Worthington Pump, com.	20½	19½	44½
YADKIN RIVER PWR., 7% pf.	l107	102	107½
Yale & Towne, com.—25	k 69	60½	73½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Saturday, Nov. 20. lBid, low, high, Tuesday, Nov. 23. mLatest quotations available.

ended Aug. 31 amounted to $212,854, as compared with $214,473 in 1925, and gross earnings totaled $472,564, against $448,623 for the same period. Gross earnings for the twelve months ended Aug. 31 amounted to $752,865, while net before interest totaled $401,166.

Public Service Corporation Organizes in Vermont.—The Public Service Corporation of Vermont, organized by the Insull interests to operate the recently purchased Hortonia Power Company of Rutland, elected the following officers last week: President, W. A. Buttrick; treasurer, H. L. Harris; secretary, C. A. Forrest; general manager, W. H. Lawson. The board of directors includes, besides Messrs. Buttrick, Harris and Lawson, Walter S. Wyman, Augusta, Me.; P. T. Hanscom, New York; George Otis Spencer, Augusta, and C. D. Spencer, Rutland. C. A. Ingalls will continue as general superintendent of the company.

New Capital Issues

First and refunding mortgage 5 per cent gold bonds of the Texas Power & Light Company were offered during the week ended Nov. 24 to the amount of $16,000,000, the price being 97 and interest, yielding about 5.20 per cent. These bonds, dated Nov. 1, 1926, and maturing Nov. 1, 1956, are secured by a direct first mortgage on a substantial portion of the company's property and by a mortgage on the balance of the physical property, subject to $15,005,000 first mortgage bonds.

During the week under review the Houston Lighting & Power Company issued first lien and refunding mortgage gold bonds, series A, at 99½ and interest, a piece of financing involving a total of $2,000,000. These 5 per cent bonds mature March 1, 1953.

The McGraw Electric Company issued three-year 6½ per cent secured gold notes, totaling $1,400,000, the price being 100 and accrued interest. The company was organized to consolidate the public utilities formerly operated by the Platte Valley Power & Light Company and the Central West Public Service Company and their subsidiaries, as well as other independent utilities recently acquired. These properties serve 129 cities and towns in Iowa, Nebraska, Minnesota, South Dakota and North Dakota.

The Central Illinois Public Service Company made an offering of first mortgage and refunding 5 per cent gold bonds, series E, amounting to $2,425,000, the price being 97 and interest, yielding about 5.20 per cent. A one-milion-dollar offering was made by the Railway & Light Securities Company in the form of 5 per cent collateral trust sinking-fund bonds.

With the purpose of raising funds for the acquisition of additional property the Electric Public Service Company issued fifteen-year 6 per cent

secured gold bonds, series B, to the amount of $1,000,000, the price being 98 and interest to yield over 6.20 per cent. The company now serves electric light and power to eighteen communities in Ohio and Oklahoma and will serve, through a subsidiary, six communities in Colorado.

American & Foreign Power Earnings Rise Greatly

Stockholders' Sanction Secured to Acquire Electric Bond & Share's Holdings in Havana Electric Company

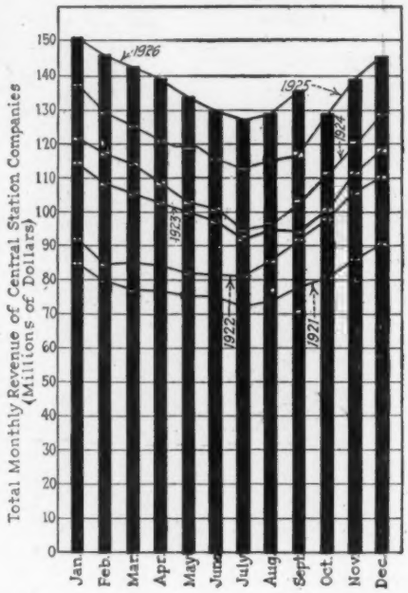
IN VIEW of its extensive foreign operations, something of special interest attaches to the recently published report of the American & Foreign Power Company, Inc. The high lights of the report are a very substantial rise in gross earnings of subsidiaries, a definite and clear-cut plan for acquisition of the Electric Bond & Share Company's holdings in the Havana Electric & Utilities Company, and a decline in the balance applicable to depreciation and to American & Foreign Power Company's second preferred and common stocks. In addition to Cuban properties, the company has operations in Panama, Ecuador and Guatemala.

Since 1924 gross earnings of subsidiaries have grown from $6,648,873 to $9,024,072. For the calendar year 1925 they were $8,847,971. Operating costs also rose rapidly, and net earnings showed a slight decline, from $3,375,433 in 1925 to $3,317,509 for the year ended June 30 last. This resulted also in a decline in the company's gross and the undistributed income of subsidiaries.

Confirmation at a recent meeting of stockholders of the purchase, already referred to, of holdings in the Havana Electric & Utilities Company, which controls the Havana Electric Railway, Light & Power Company, provides that the Electric Bond & Share Company shall receive the following as full payment for its holdings of securities and as compensation for its overhead costs and risks: Either 20-year 6 per cent debentures of American & Foreign Power Company or 20-year 6 per cent debentures of a Cuban subsidiary equal in principal to the actual costs of Electric Bond & Share Company to date of payment, excluding overhead costs but including interest at 6 per cent, and 300,000 shares of common stock of the American & Foreign Power Company.

In discussing the various undertakings of the subsidiaries, President Mitchell says that the Panama and Guatemala properties of the American & Foreign Power Company, Inc., the earliest acquisitions, are now operating on a satisfactory routine basis. Properties in Cuba and Ecuador, having been more recently acquired, are still experiencing the rehabilitation difficulties usual and incident to bringing about proper organization and operation of public utility properties. This condition is accentuated in foreign countries, and the time element required to produce satisfactory returns is longer there than is usual in this country.

Gross Revenue Totaled $135,600,000 in September



Reports received by the ELECTRICAL WORLD from central-station systems representing 78 per cent of the total generator rating of the industry indicate that the total gross revenue from ths sale of energy during the month of September was $135,600,000, an increase of $18,200,000, or 15.4 per cent, over September of last year. The operating and maintenance expenses totaled $60,500,000.

The capitalization of American & Foreign Power Company, Inc., as of June 30 last included $56,874,764 of capital stock, represented by two preferred and one common issue—362,329 shares of preferred, 114,019 shares of second preferred and 943,988 shares of common.

German Utility Calls Bonds.—Certain first mortgage 7 per cent sinking-fund gold bonds of the Oberpfalz Electric Power Corporation have been called for payment Dec. 1 at par and interest. These bonds, aggregating $14,500, fall due June 1, 1946.

Public Service of New Jersey Stock Listed.—The New York Stock Exchange has authorized the listing on or after Oct. 20 of 3,557,275 shares of common stock without par value, on official notice of issuance in exchange for the outstanding common stock.

Shawinigan Shares Split.—The long-expected split-up of Shawinigan Water & Power Company shares was announced following a meeting of the board of directors in Montreal on November 16. The basis of the split is four for one, the new shares to be of no par value. What is considered most important about this development is the fact that the new stock will place Shawinigan within the reach of the small investor, something which the high price of the past year or so has prevented. The company has capital authorized by the government of $40,000,000. Shareholders have authorized the issue of stock up to $30,000,000. The recent issue of $2,500,000, offered to shareholders at 150 on a basis of one in ten, brought the paid-up capital to $27,500,000. This leaves $2,500,000 to be issued at the discretion of the directors. This under the split-up means 100,000 shares of the new stock. The funded debt of the company stands at a little over $26,000,000.

Syracuse Lighting Increases Capital.—The Syracuse Lighting Company, Inc., has filed a certificate at Albany, N. Y., increasing the authorized capital stock from 205,000 shares to 1,100,000 shares, of which 100,000 shares are preferred, par $100, and 1,000,000 shares are common, no par value.

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
Associated Gas & Elec., orig. pf., ex.	$0.12½	Dec. 31
Associated Gas & Elec., orig. pf.	.87½	Dec. 31
Associated Gas & Elec., $7 pf.	$1.75	Dec. 31
Laclede Gas Light, com. extra	2	Dec. 15
Laclede Gas Light, com.	2	Dec. 15
Laclede Gas Light, pf.*	2½	Dec. 15
National Power & Light, pf.	$1.75	Jan. 3,'27
Niagara, Lockport & Ont. Pwr., com.	.75	Dec. 31
Niagara, Lockport & Ont. Pwr., pf.	1¾	Jan. 1,'27
Quebec Power, com.	1½	Jan.15,'27
Quebec Power, pf.	1¾	Jan.15,'27
Southern California Edison, pf. A.	1¾	Dec. 15
Southern California Edison, pf. B.	1¾	Dec. 15

*Semi-annual

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of September:

Name of Company	Gross Earnings for September 1926	1925
Adirondack Power & Light	†827,246	†754,540
American Gas & Electric	5,865,053	5,307,256
American Power & Light	4,852,713	4,383,296
American Water Wks. & Elec.	3,736,436	3,371,735
Bangor Hydro-Electric	†146,065	†133,444
Barcelona Trac., Lt. & Pwr.	6,901,636	6,965,437
Baton Rouge Electric	76,454	65,421
Binghamton Lt., Ht. & Pwr.	161,128	139,994
Blackstone Valley Gas & Elec.	445,297	418,093
Broad River Power	191,390	139,148
Cape Breton Electric	50,711	45,433
Carolina Power & Light	709,809	622,196
Cities Service	1,875,103	1,231,069
Commonwealth Power	†4,308,443	†3,950,046
Community Power & Light	395,667	330,729
Consumers Power	†2,153,423	†1,864,005
Detroit Edison	†3,944,307	†3,592,817
Edison Elec. Illg. of Brockton	140,110	131,449
El Paso Electric	236,324	212,435
Electric Light & Power of Abington & Rockland	55,223	51,372
Federal Light & Traction	533,157	453,458
Florida Public Service	131,386	93,991
Fort Worth Power & Light	231,106	239,295
Galveston-Houston Electric	395,969	331,520
General Gas & Electric	1,991,498	1,713 019
Idaho Power	260,292	266,777
Lake Shore Electric Railway	*280,375	*275,933
Lowell Electric Light	134,330	125,462
Manchester Trac., Lt. & Pwr.	242,846	204,977
Metropolitan Edison	784,755	716,180
Nebraska Power	360,460	336,182
Nevada California Electric	387,133	362,110
New Bedford Gas & Edison Lt.	332,231	310,144
New Jersey Power & Light	206,394	116,560
North Carolina Public Service	181,753	147,627
Northern Pennsylvania Power	62,582	55,062
North Texas Electric	202,958	200,438
Pacific Power & Light	322,003	315,875
Philadelphia Company	4,558,121	4,436,444
Public Service of New Jersey	8,624,487	7,542,143
Puget Sound Power & Light	1,114,925	1,027,934
Savannah Elec. & Pwr.	185,093	165,105
Sierra Pacific Electric	113,879	92,657
Southwestern Power & Light	1,342,526	1,265,404
Tampa Electric	405,030	298,240
Tennessee Electric Power	†1,025,975	†1,005,278
Texas Power & Light	644,000	614,741
Utah Power & Light	889,400	842,111
Winnipeg Electric	445,512	409,185
York Utilities	15,591	12,726

* August. † October.

Manufacturing and Markets

Industry's Responsibilities

Gerard Swope Considers Subject from Four Points of View—Leading Light of Press Help to Modern Industry

DISCUSSING the responsibilities of modern industry from four points of view, Gerard Swope, president of the General Electric Company, spoke at the annual dinner of the Associated Business Papers, Inc., at the Hotel Astor, New York, Nov. 10. The points of view from which the subject was treated were, first, the standpoint of the public; second, the standpoint of the employees; third, the standpoint of the shareholders, and fourth, the standpoint of the industry itself.

From the standpoint of the public Mr. Swope said that his conception of industry is not primarily for profit but for service; but the responsibilities of industry to the public are not only for service but also for quality of material that is furnished, and, more important than that, industry should not have a complacent attitude but a forward-looking one. This does not mean a cut-throat policy, according to Mr. Swope, but it means the application of intelligence and of science to the problems before us, better methods being introduced in industry so that without reducing the earnings of labor the selling prices to the public can still be reduced.

Referring to the responsibilty of industry from the standpoint of the employees, Mr. Swope said that the thing that distinguishes modern industry in America from that in any other country in the world is the much greater power that the United States puts in back of the workingman as compared with other countries. He stressed the point that nothing can take the place of adequate earnings. Next came the necessity for safeguarding the workingman by removing some of his worries in order that he may give to his work the best that is in him. Such safeguarding would include problems of life insurance, adequate housing, thrift and investment and unemployment.

The responsibility of industry to the shareholders consists in a fair, regular and uniform return on the investment so that when management needs new capital it will be forthcoming. Mr. Swope said that if one is going to expect the confidence of the shareholders, they must be told of the activities of the company and of the business, which would include adequate publicity in regard to its earnings, its orders and its shipments. Those who put their lives in the business and those who put their earnings in the business are entitled to at least that consideration, Mr. Swope thought, and no business really can be successful over a long period that does not recognize those elements.

The fourth responsibility of modern industry, the responsibility of industry to itself, was shown by Mr. Swope to have had increased consideration in the last twenty years because of greater attention to the question of what organization and association of different companies in America can be brought to mean. Large and small companies are associated together and they meet on a basis of equal opportunity. Industry has more to fear from the unsuccessful than from the successful, Mr. Swope believed—from wrong policies, from ignorance of method and from ignorance of the elements of cost. There is a tremendous job to be done, in the opinion of Mr. Swope, and he maintained that small companies in many ways need organizations of this character more than large ones, because large companies have a national organization, have statistics in regard to industry, know facts and know conditions upon which to base the work they are planning. No intelligent plan can be made without a proper conception of the program and also of the facts that underlie that program.

In referring to the ideals and ethics of the business press Mr. Swope said that it seemed that the organization of Associated Business Papers can do a tremendous amount of good in leading modern industry along the paths it should go by providing helpful, instructive criticism, right understanding and an interpretation of the philosophy and trend of modern industry. If that leading light exists, Mr. Swope believes that modern industry will serve the public better than ever has been done before.

October Contracts Show Unseasonal Gains

Marked Gains Noted in Contracts Let for Commercial Buildings, Sewers, Etc.—Permits Below Normal

VALUE of engineering construction contracts awarded this year up to Nov. 1 is 14 per cent greater than for the corresponding period last year, and proposed work represents a gain of 15 per cent compared with the first ten months of 1925, according to the *Engineering News-Record*. The construction volume index number was 244 for the month of October and 201 for the whole of 1925, as against 100 for 1913. This means that the actual volume of contract letting during October (not the mere money value of the contracts let) is 144 per cent above the volume for 1913.

Marked gains in contract letting were noted during October in sewers, excavation, drainage, irrigation, levee, river and harbor work, commercial buildings and unclassified public projects. Heavy increases in proposed work occurred during the last month in waterworks, sewers and various unclassified jobs. This is in direct contrast with the recent slump in building permits. The fact that such permits have fallen about 2 per cent below the point of normal seasonal decline would indicate that further recession in the volume of general construction will affect mostly speculative buildings of a residential nature.

In the accompanying table of contracts awarded for the month of October a minimum value was adopted on each class, in order to eliminate the small jobs and present a concentrated total for engineering construction throughout the entire country. Minimum values were: Waterworks and ex-

Value of Contracts Let in the United States and Canada During October, 1926

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States	Jan. 1 to Date U. S.	Canada
Waterworks	$447,000	$514,000	$182,000	$2,708,000	$204,000	$159,000	$4,214,000	**$52,231,000**	$30,000
Sewers	289,000	4,222,000	1,684,000	3,934,000	766,000	886,000	11,781,000	**87,813,000**	56,000
Bridges	50,000	2,149,000	557,000	1,929,000	1,197,000	279,000	6,161,000	**71,838,000**	389,000
Excavation, drainage, irrigation	11,000	480,000	16,000	450,000	507,000	3,284,000	4,748,000	**25,350,000**	28,000
Streets and roads	125,000	9,083,000	5,044,000	11,181,000	9,132,000	6,344,000	40,909,000	**434,633,000**	719,000
Industrial building	2,145,000	1,620,000	1,991,000	7,756,000	1,423,000	426,000	15,361,000	**258,507,000**	.....
Commercial building	10,610,000	54,566,000	5,830,000	46,499,000	4,161,000	22,484,000	144,150,000	**1,262,268,000**	3,900,000
Federal government	12,000	779,000	369,000	279,000	360,000	688,000	2,487,000	**46,649,000**	.....
Unclassified	339,000	1,561,000	362,000	2,281,000	608,000	3,882,000	9,033,000	**178,134,000**	169,000
October, 1926	$14,028,000	$74,974,000	$16,035,000	$77,017,000	$18,358,000	$38,432,000	$238,844,000	**$2,415,362,000**	$5,291,000
September, 1926	33,620,000	70,027,000	24,354,000	63,210,000	52,341,000	32,905,000	276,457,000	.....	8,254,000
October, 1925	22,798,000	105,328,000	19,896,000	62,019,000	30,382,000	37,594,000	278,017,000	.....	13,007,000
Jan. 1 to date, 1926	**203,318,000**	**737,968,000**	**242,660,000**	**610,059,000**	**357,240,000**	**264,117,000**	**2,415,362,000**	.....	**100,387,000**
Jan. 1 to date, 1925	176,153,000	769,982,000	203,116,000	383,902,000	356,152,000	237,619,000	2,126,924,000	.....	75,850,000

cavating jobs, $15,000; other public works, $25,000; industrial buildings, $40,000; commercial, educational, religious and other buildings, $150,000. The excavating work comprises drainage, irrigation, levee, river and harbor projects.

Australian Market for Electrical Appliances

Most of the electrical household appliances imported into Australia are supplied by the United States and Great Britain, says the United States Department of Commerce in its trade information bulletin No. 441. The problem of characteristics of current to which small electrical equipment must be suited is not only an essential one but often the most elusive that the exporter of American electrical equipment must face, according to the department. Consumers' voltages vary greatly throughout the Commonwealth and also within the various states, different voltages even being found within certain city areas.

The total population of Australia according to the latest census (April 4, 1921) was 5,435,734 and the number of dwellings was 1,211,924. It is unofficially estimated that at the end of 1925 there were approximately 1,331,000 dwellings in Australia, of which about 452,472 were wired. But the number of these that use one or more electrical labor-saving devices, with the exception of the flatiron, is very small. The bulletin contains a list of the central light and power plants in Australia as well as New Zealand, and the list specifies the current characteristics. Marketing methods of the various appliances are also discussed.

Continued High Activity During October

October Operations of Electrical Manufacturing Plants 2.4 per Cent Under Those of September—Plants Operating Under Greater Pressure than in Other Primary Industries

THAT the high degree of activity in the electrical manufacturing industry reported during September was continued, though slightly decreased, during October is indicated from reports of electrical energy consumption by these plants during these months. This continued high rate of activity was reported by both large and small plants.

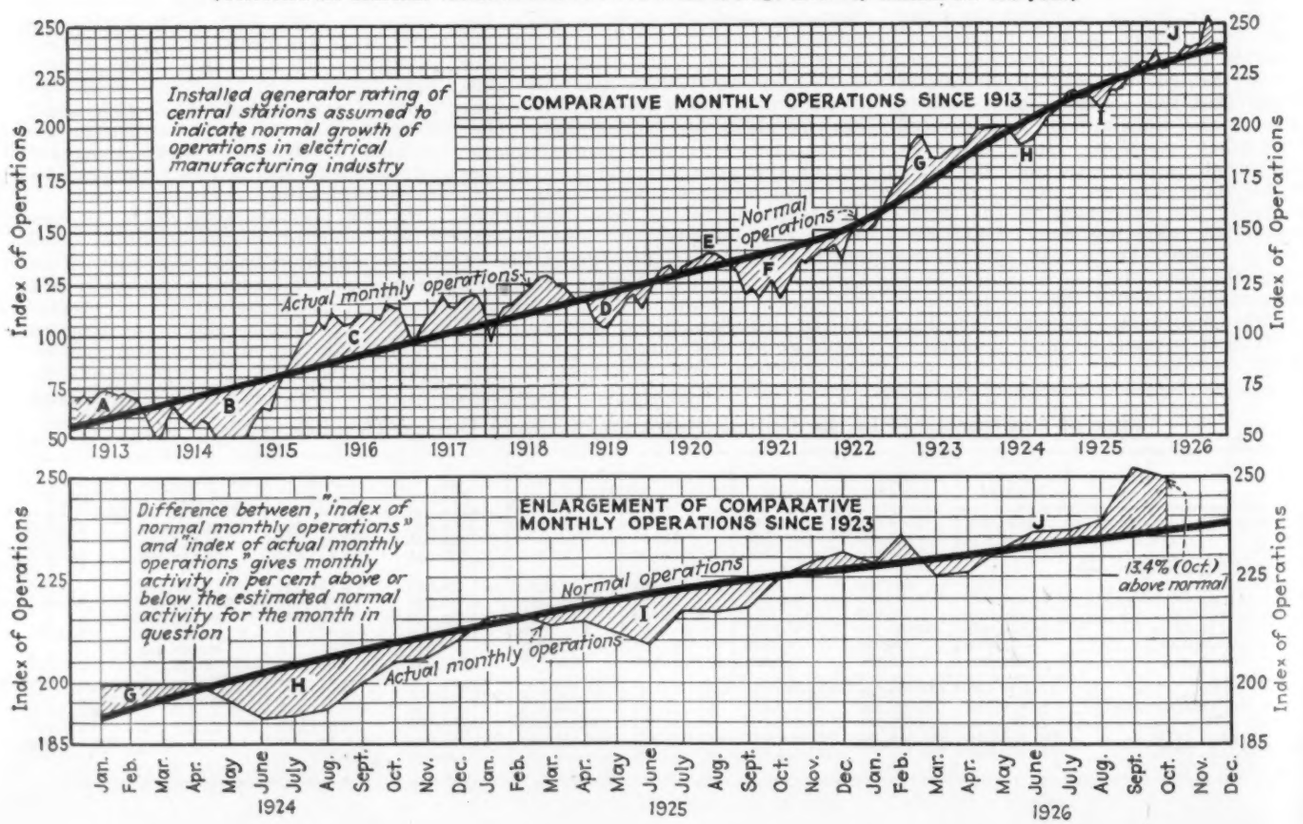
Reports received by the ELECTRICAL WORLD from a large percentage of the electrical manufacturing plants of the country indicate that during October the electrical manufacturing plants of the nation consumed 67,960,000 kw.-hr. of electrical energy as against 69,600,000 kw.-hr. in September, a loss of 2.4 per cent. In spite of this loss in operations by the industry as a whole, some plants recorded operations over those of September. Such is the picture of activity in the electrical manufacturing plants of the nation based upon reports received by the ELECTRICAL WORLD on electrical energy consumption by a large percentage of the operating companies.

Reports received for the month of October indicate that the industry was operating at 13.4 per cent above the estimated normal for that month as against 17.3 per cent above the estimated normal for September. This rate of activity in the electrical manufacturing plants during September and October is materially above the activities reported by these plants during the fall months of last year and also materially above the operations during the first half of this year. A comparison of the activities during August, September and October, without seasonal correction, indicates that the actual production activities during October were 2.4 per cent under those of September and 3.6 per cent over August operations.

This high rate of activity in the electrical manufacturing plants is but a reflection of the high rate of activity being reported by American industry in general. General industry during October was operating at 2.2 per cent above September and 7.4 per cent above October of last year. The rolling mills and iron and steel plants were operating at 2.5 per cent above September, the textile plants 8.9 per cent above September, while the automobile manufacturing plants reported operations 6.7 per cent under August. The electrical manufacturing plants, therefore, were operating above the rate of activity reported by most of the primary industries during October.

***Electrical World* Barometer of Activity in the Electrical Manufacturing Industry**

(Corrected for seasonal variation and referred to an average monthly normal for the year)



Electragists to Develop New Wiring Standards

Standards for wiring installations will be developed and adopted by the Association of Electragists International, since, states the association, no standards for wiring installations have existed which have adequately defined what constituted the best practice in such installations under any and all conditions. The Electragist standards will include the engineering design of installations, the definition of the types of wiring which are suitable for use under various conditions, specifications for materials and apparatus and the methods of installing the materials and apparatus.

The association states that it is not the purpose of the Electragists to set up new standards of any nature where satisfactory standards have already been established by other agencies and that wherever satisfactory standards for materials, apparatus or installation methods have been adopted as American engineering standards by the American Engineering Standards Committee or have been established by the National Electrical Manufacturers' Association such standards will be incorporated. The association states that there will be no conflict between its standards and the National Electrical Code, and in order that an installation may be in accordance with its standards all requirements of the National Electrical Code must be complied with.

Business Conditions

STEADY business is noted in the electrical industry, and active buying is reported from some quarters. Industrial-plant sales continue to hold up well with mine companies in the Illinois fields placing several orders. Several buyers have reported that quotations on general-purpose motors show about a 5 per cent decrease in price, but no announcement of price decrease has been made by any manufacturer. Sales of this commodity are good, especially in the smaller and fractional-horsepower sizes. Merchandising sales play a prominent part in the business activity at this season, with reports from jobbers indicating an active market.

In New England power-equipment sales show a gain and there is a steady demand for general supplies. Small-motor sales are holding up well and the trend in the jobbing trade is encouraging. Sales are spotty in the New York district, but the volume of business is fair and the demand for switching equipment is active. In the Southeast business is quiet, but the outlook is encouraging. A reasonably satisfactory number of inquiries are being received from textile mills. The phenomenal demand for coal in the Illinois fields has resulted in the mine companies placing many orders in the St. Louis district for equipment. Estimates are now being submitted for transformers and switching apparatus for a substation in St. Louis, and a north Texas power company is now doubling its underground switching equipment. Building construction is strong in the Middle West, and industrial activity continues, with a considerable amount of business being placed by the railroad companies. On the Pacific Coast power-company business in general averages fairly well and industrial firms have been active and have placed many orders for equipment.

Copper Sales Good—Tin Reaches New High Level

Sales of copper have been active, with a large electrical manufacturer and a leading brass mill among the largest buyers. Prices, however, were not affected. Some business was reported placed in the Middle West at 13.87½ cents delivered, but the quantity was small. Since the metal is not difficult to obtain, consumers are not placing forward orders despite the active status of their business.

NEW YORK METAL MARKET PRICES

	Nov. 17, 1926 Cents per Pound	Nov. 24, 1926 Cents per Pound
Copper electrolytic	13⅞	13.70
Lead, Am. S. & R. price	8	8
Antimony	13	13½
Nickel, ingot	35	35
Zinc spots	7.60	7.50–7.55
Tin, Straits	71½	71¼
Aluminum, 99 per cent.	27	27

Base copper price Nov. 24, 1926, 16 cents.

Lead business is steady, with a fair demand for prompt metal. The American Smelting & Refining Company continues its official contract price at 8 cents, New York. Little interest is being exhibited by consumers in the zinc market. Tin reached a new high level, with the strength in the domestic market principally on spot and early delivery.

Power Equipment Sales Gain in New England District

Several interesting power equipment orders and a steady demand for general supplies and equipment marked the electrical market in the New England district. A manufacturer recently received an order for a 45,000-hp. turbo-generator and accessory units to be delivered at Norfolk, Va. An 800-hp. motor, together with control and switching apparatus, amounting to about $20,000, was ordered by a northern New England paper company, and another interesting equipment purchase consisted of two 1,500-hp. boilers which are to be used in connection with a new power development of a Boston central-station company.

Small-motor sales are holding up well, oil-burner manufacturers having recently placed orders for a large number of 1-hp. motors; loom motors are in demand, and textile industries are active in the electrical equipment market. The trend in the jobbing trade is encouraging, general supplies are moving well, and the demand for household appliances is growing with washers in outstanding demand, although portables and cleaners are attracting much interest. One group of central-station companies operating in this district records an increase of 16 per cent in appliance sales for the past week as compared with the corresponding week in 1925.

Sales in New York District Spotty, but Volume Fair

Sales to central-station companies in the New York district are spotty, with some lines showing a considerable increase in activity during the past week. Switching equipment sales have been good and include one order for 66-kv. equipment aggregating more than $15,000. Inquiries in this line are also active, and one order amounting to about $25,000 is expected to be placed this month. Transformer sales are increasing, although no single outstanding order is reported. The demand for poles and cross-arms is fair, buying generally being limited to small lots. Pole-line hardware business is dull both in number of sales and inquiries. Industrial buying is falling off, both motors and control apparatus showing a decided decrease in the volume of sales this week. Jobbers report a lull in the demand for appliances, with a fair market for other lines.

Business Quiet in Southeast—Outlook Encouraging

Business has been more quiet in the Southeast than for several weeks past, but this is a usual lull at this period of the year. However, there is some small electrification work under way and more in prospect. There are a reasonably satisfactory number of inquiries on hand from textile mills, and indications are that orders for some of these materials will be placed within the next few weeks. The volume of small orders for motors up to 200 hp. is very satisfactory, and distribution transformers and meters continue in active demand. Several large transformer orders from power companies in central Georgia, Mississippi and Louisiana are pending and will probably be released within the next few days. In the western part of the territory there is a marked tendency to electrify rice and sugar mills, with a consequent satisfactory volume of orders for electrical equipment devoted to this line of industry. There is also a call for the extension of transmission lines, and some power-transformer orders are reported from this section. An order for a 500-kw. turbo-generator was placed last week by a large woodworking plant. This will call for electromotive equipment, though orders for that apparatus have not yet been placed.

Industrial Firms Active Buyers on Pacific Coast

Power-company business in general averages fairly well on the Pacific Coast and is especially good in pole-line hardware. Railroad orders are fair and mainly for supplies and tools. Miscellaneous inquiries from contrac-

tors include two complete signaling equipments for hospitals, two special control panels for skyscrapers now nearing completion and a job for 2,000 lighting units worth about $10,000. Contractors' orders are especially strong in such schedule material as brass-shell sockets and tumbler switches. Prices are stronger and further advances are expected, though the new levels are below those of last August. Outstanding machinery orders cover one motor of 900 hp. and another of 400 hp., worth together about $20,000 and purchased by a match company for cable tram work for its lumber operations.

Material increase in buying and the receipt of specifications on several projects were noted by Seattle jobbers. A Tacoma lumber company awarded a Seattle firm the contract for furnishing 36 motors and control, ranging from 75 hp. down. Another Seattle firm reports an order for a 100-hp. motor and 6-in. pump for an irrigation project at Chelan, as well as another order for fifteen motors totalling 200 hp. for a lumber mill at Port Gamble. A timber company at Lewiston, Idaho, bought three transformers, a switchboard, motor-generator set and a rope drive for a new mill, and several other orders were also placed.

Building Construction Strong in Middle West

One of the most encouraging items in the business news of the Middle West is the remarkable record of building construction in Chicago and the surrounding territory. Completed reports for this district indicate a 2 per cent gain in building construction. It is estimated that this construction will reach $500,000 for 1926. Industrial activity continues strong, with a considerable amount of business being placed by the railroad companies. The various utility companies are busy. The purchases of a large company continue to average over $85,000 per day. Construction work is active and quite a sizable winter program is planned.

Among the interesting orders placed were one for a three-unit 280-kw. battery-charging booster set, a 1,500-kw. 1,500-volt mercury-arc rectifier, a construction order for floor plates, galleries and ironwork valued at $125,000, and a sizable order for ammeters.

Coal Mines Placing Many Orders in St. Louis District

Conditions in the St. Louis district have not changed materially. The phenomenal demand for coal in the Illinois fields caused by large export business from the Eastern fields has resulted in a very considerable number of good-sized orders for electrical machinery, mainly medium-sized motors, transformers, meters and switching equipment. The effect has been that the daily tonnage now being hoisted is the greatest since the record established during the war. No large contracts have been signed during the period, but estimates are being submitted for the apparatus for a new substation in St. Louis. The power company in one of the largest cities in north Texas is doubling its underground switching equipment.

Activities of the Trade

Automatic Electric Washer Announces Low-Priced Model

The "Model 20 Automatic" washer, which can be retailed for less than $100 is announced by the Automatic Electric Washer Company, Newton, Iowa. Pressed-steel parts are used in place of cast iron, and the legs are electrically welded to the leg braces. The manufacturer states that by this method of manufacture large savings in weight are effected with increased strength, but quality has not been sacrificed. The machine has a standard six-sheet capacity tub of copper, weighs only 130 lb. and requires a floor space of only 24 in. square.

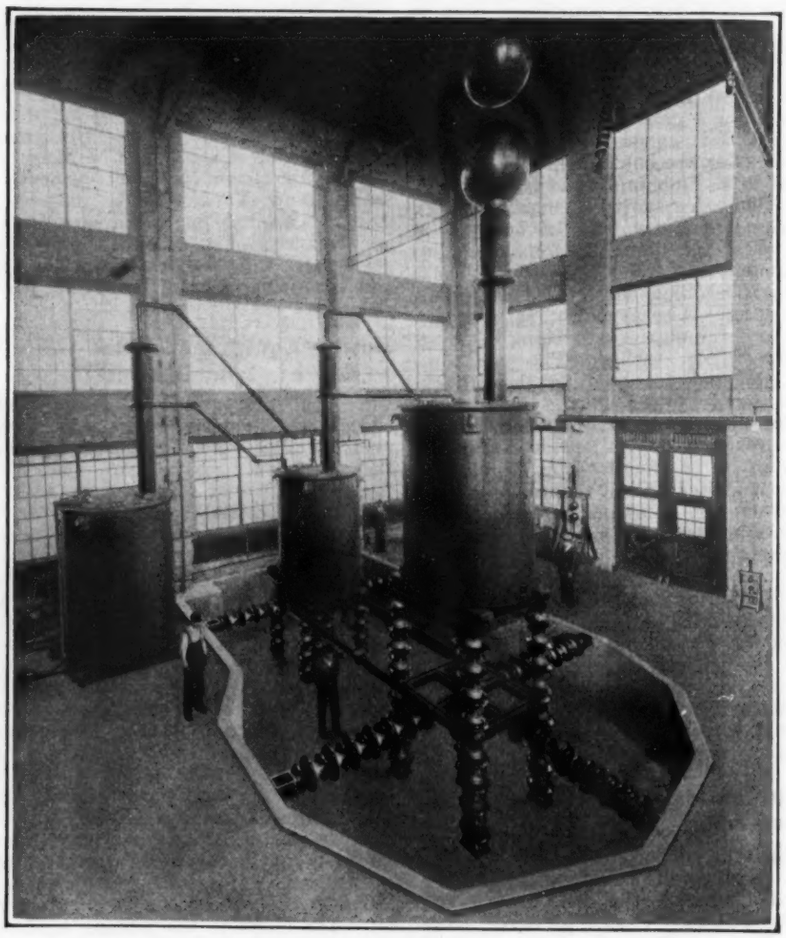
E. P. Gleason Company Reorganizes

Following the death of Elias Whitney, for the past twenty-two years proprietor of the E. P. Gleason Manufacturing Company, 37 Murray Street, New York, the business has been completely reorganized and incorporated and will be known as the E. P. Gleason Manufacturing Company, Inc. The business was originally established by E. P. Gleason in 1851, at 135 Mercer Street, New York. This pioneer firm was built around the development of the gas burner and sponsored the "Argand," the most successful gas burner of that period. Mr. Gleason remained in continuous control of the company for 50 years, until his death in 1901. As the business expanded it was removed to larger quarters at 20 West Houston Street in 1873 and 1904 to its present address at 37 Murray Street.

The officers of the new corporation are George E. Mallinson, president; Perry Gleason, vice-president; Harold C. Albertson, treasurer and general manager, and William G. Sherrer, secretary. The new management will continue the business along the same general lines, offering a complete line of residential and commercial lighting fixtures and novelties. A new commercial unit, the "Gleasonlite," will be placed on the market in the near future. The showrooms are being completely renovated and remodeled.

Delta-Star Builds High-Tension Testing Laboratory

To make sure that its high-tension electrical equipment shall undergo extensive investigations and tests in order that the equipment offered for sale shall meet the severe conditions imposed by



750,000 VOLTS IS AVAILABLE FOR TESTING IN DELTA-STAR LABORATORY

modern interconnection of transmission systems, the Delta-Star Electric Company, Chicago, has constructed a well-equipped testing laboratory. This testing laboratory is for use of the company's designing engineers and affords a means of securing the data necessary to make equipment which will have the desired characteristics.

The three transformers used are each of 250 kva. capacity and weigh approximately 18 tons each. They have primaries of 2,000 volts, secondaries of 250,000 volts and are arranged for the cascade or chain connection. Excitation and control of the transformers is secured by a synchronous motor-generator set, the 2,000-volt winding of the first transformer being connected directly to the alternator. With three transformers in series, there are 750-000 volts between the high-tension terminal of the third transformer and ground.

Westinghouse Receives Order for Large Turbo-Generator

The Westinghouse Electric & Manufacturing Company announced the receipt of a contract for a 45,000-hp. steam turbo-generator from Stone & Webster, Inc., Boston, for the plant of the Virginia Electric & Power Company in Norfolk. The company states that this device will be the largest of its kind in Virginia and will increase the power company's capacity by almost 30 per cent.

Truck Manufacturers Continue Market-Building Program

Manufacturers of electric industrial trucks and tractors, storage batteries, charging equipment and tires, meeting at the Buffalo Athletic Club on Nov. 10, determined to continue their program of intensive market development. This activity, conducted under the auspices of the Society for Electrical Development, represents the first to get off to a new start under the society's five-year plan of co-ordinated electrical market development. Those present at the meeting included G. A. Freeman, E. R. Kleindinst and R. J. Mulholland, Automatic Transportation Company; M. A. Watterson, Baker-Raulang Company; P. W. Saitta, Crescent Truck Company; G. E. Stringfellow and P. R. Nelson, Edison Storage Battery Company; M. R. Berry, Electric Products Company; C. B. Cook and R. Smith, Elwell-Parker Electric Company; A. F. Mason, Firestone Tire & Rubber Company; John Hertner, Hertner Electric Company; W. A. Meddick, Lakewood Engineering Company; M. R. White, Liberty Electric Company; R. W. Chandler, Philadelphia Company; W. S. Cranmer, Philadelphia Storage Battery Company; F. A. Babcock, Wright-Hibbard Electric Company, and H. J. Fuller and C. B. Moeller, Yale & Towne Manufacturing Company.

The International Combustion Engineering Corporation, 43 Broad Street, New York, has had its entire offering of 32,307 shares of new stock underwritten in England. Stockholders of the company of record of Dec. 2 will have the right to subscribe to one share of new stock at $47 for each 20 shares owned at that time. The company has recently closed contracts for the erection of two low-temperature distillation plants in England.

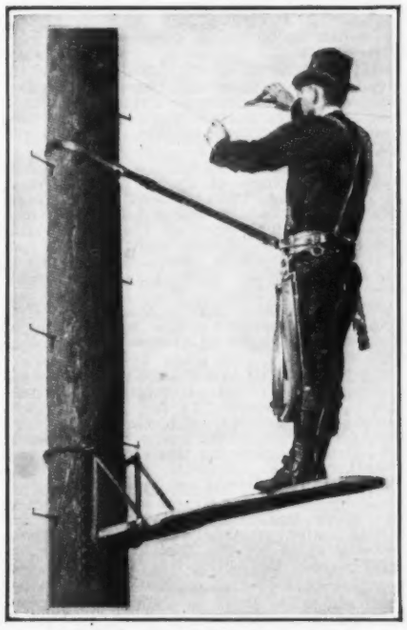
The Weston Electrical Instrument Corporation, Newark, N. J., reports that for the nine months ended Sept. 30, 1926, the net income amounted to $537,-802 and compares with $513,282 for the corresponding period last year. This amounts to $2.60 a share on the class A stock and to $1.85 a share on the common stock.

The Edison Electric Appliance Company, Inc., 5600 West Taylor Street, Chicago, announces a new automatic toaster known as the "Conveyor" toaster. The unit is for use in restaurants, sandwich shops, cafeterias, etc., and will deliver from one to four slices of toast every fifteen seconds.

New Equipment Available

Lineman's Safety Platform

The "Pierce" lineman's safety platform, designed to give safety to the lineman when dangerous work on the pole is to be done, has been placed on the market by Hubbard & Company, Pittsburgh. With this platform, as shown in the illustration, a lineman can place himself in the proper position to do his work safely and expeditiously. The chain used is 5½ ft. long and is made of high-grade steel with links of the proper size to give close adjustment. With the close adjustment of the chain and the steel spears for pole contact, side movement of the platform is almost entirely eliminated. The platform is made from a specially cured aëroplane spruce and both ends are doweled to prevent splitting. The platform is also treated with a special insulating and waterproofing material which acts as a wood preservative and prevents the board from becoming slippery when wet. Each platform is given a 600-lb. mechanical test 12 in. from the end before shipment.



PLATFORM WHICH PERMITS LINEMAN TO DO HIS WORK SAFELY

Wire Stripper.—A bench type wire stripper with very few moving parts has been placed on the market by the C. H. Carlson Manufacturing Company, 13 Main Street, N. E., Minneapolis. This device is said to insure fast, uniform stripping of wire ends on all sizes up to No. 6 solid or stranded and will cut wire of all sizes up to No. 10 solid or stranded. It quickly removes the insulation on cotton, rubber or asbestos covered wires without injury to the wire and is especially efficient in stripping stranded wire.

Electric Steam Generator

The Bigelow electric steam generator, available in sizes from 12 kw. to 300 kw. and developed with the cooperation of the General Electric Company, has been placed on the market by the Bigelow Company, New Haven, Conn. These units are intended for plants where it is profitable and economical to generate steam by the use of electrical energy.

The 12-kw. and 24-kw. units are operated entirely by an automatic panel and the larger sizes are operated by the use of an automatic panel and hand-operated switches. Every 10 kw. of capacity is approximately one boiler-horsepower. The horsepower rating of the steam generator can thus be obtained by dividing the kilowatt capacity by ten. The heating units operate on a three-phase voltage of 110, 220 or 440, depending on the size. The boiler unit is designed for 100 lb. working pressure in accordance with the A.S.M.E. boiler code requirements.

Printing Paper

A printing paper called "Ozalid" which produces a positive print, having dark red or maroon lines on a light cream background, direct from the original without a negative has been developed by the Eugene Dietzgen Company, Chicago. It is printed in the same manner as blueprints, but instead of being developed by washing with water and fixing with bichromate of potash and then dried, "Ozalid" prints are developed dry by brief exposure to ammonia water vapor. A non-fading print that can be shaded or colored or written upon with pencil and ink is produced. Because the print is developed dry it does not shrink or wrinkle and is true to scale, easy to handle and the paper retains its original strength. Prints made on thin "Ozalid" paper can be used as originals from which other prints can be made, and sub-contractors can use these prints for skeleton drawings for detailing their work and then make other prints from these.

New Trade Literature

ELECTRIC EQUIPMENT FOR THE LUMBER INDUSTRY.—"Electric Drive in the Lumber Industry" is the title of bulletin GEA-106 issued by the General Electric Company, Schenectady, N. Y., in which it calls attention to the advantages of the use of electrically driven machinery in the lumber industry. It contains descriptions and illustrations of the various types of electrically driven machines used from the logging camp to the lumber mill, including an electric combined yarder and boom loader, electrical equipment of an electric donkey, duplex loader, electric equipment for mill, etc.

ELECTRIC LAMPS.—Catalog No. 26 issued by the Aladdin Manufacturing Company, Muncie, Ind., describes and illustrates the various types of the Aladdin lamps, including desk lamps, table lamps, floor lamps, bridge lamps, etc.

ELECTRIC FURNACES.—A catalog issued by William Swindell & Brothers, Pittsburgh, describes the Swindell electric melting and heat-treating furnaces. It contains illustrations showing typical installations of the various types of furnaces. Drawings showing a part layout of a plant using the Swindell multiple melting furnace and a plan of a 50-ton electric melting furnace are included.

AIR FILTERS.—The Midwest Air Filters, Inc., radford, Pa., is distributing a circular describing the Midwest "Self Clean" air filter. Illustrations showing duct connection and drive arrangement are included.

TRAFFIC CONTROL.—The Wellsbach Traffic Signal Company, 1934 Market Street, Philadelphia, is distributing a folder describing the Welsbach flashing signals for traffic control.

ELECTRIC HEATING UNITS.—Bulletin C-106 issued by Henry L. Wiegand Company, 422 First Avenue, Pittsburgh, covers the "Chromalox" heating units for industrial and commercial applications. "For Heating Hard-to-Heat Places" is the title of Bulletin No. C-108 published by the company, in which it calls attention to the various types of "Chromalox" electric heaters for use in drying rooms, crane cabs, laboratories, power houses, etc.

POTHEADS.—The G. & W. Electric Specialty Company, 7780 Dante Avenue, Chicago, is distributing a folder calling attention to its type "Y" pothead for both outdoor and indoor use. Attention is also called to the G. & W. new cable support for lead-covered cables.

ELECTRICAL SUPPLIES.—The Southeastern Electric Company, Chattanooga and Knoxville, Tenn., has issued catalog No. 2, covering electrical apparatus and supplies and radio equipment which it carries. The book is cloth-bound, contains 512 pages and is arranged in sectional groups according to their classification, including wires and cables, indoor construction supplies, schedule wiring devices, switches, heating and motor-driven appliances, lighting materials, fans, motors, transformers and instruments, outdoor construction material, street lighting, tools and soldering material, and insulating materials, telephones, signal apparatus and radio.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

WESTFIELD, MASS.—Permission has been granted the Turners Falls (Mass.) Electric Power & Light Company to acquire land between Westfield and Chester and also to erect a high-tension transmission line between the towns.

WORCESTER, MASS.—Electric power equipment will be installed in the proposed local locomotive repair shops, including engine terminal buildings, machine shop and coaling plant, to cost about $500,000, of the Boston & Albany Railroad, Boston.

NEWPORT, R. I.—An agreement has been made whereby the Newport Electric Corporation will purchase about 2,500 kw. from the Fall River (Mass.) Electric Company through a tie line now being built between the two systems. From the Fall River plant underground lines will be extended to a substation at the state line, from whence an overhead, 23-kv. two-circuit line will be erected by the Newport Company, 22 miles long, to complete the interconnection.

Middle Atlantic States

BINGHAMTON, N. Y.—Permission has been granted the Binghamton Light, Heat & Power Company to extend its electric lines in the towns of Otselic and Harford.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Nov. 30 for electric cord and cable for the Navy Supply Depot, Brooklyn.

NEW YORK, N. Y.—The Warren-Nash Motor Corporation, 229 West Sixty-fourth Street, plans to install electric power equipment in its proposed service and repair building at Broadway and 133rd Street, to cost about $500,000.

HAWTHORNE, N. J.—Bids will be received by the Commissioners of the Borough of Hawthorne until Dec. 10 for the consruction of a pumping station and the installation of pumping machinery and connections.

PASSAIC, N. J.—The installation of ornamental lamps on Main Avenue and Passaic Street is under consideration by the Board of Commissioners.

SALEM, N. J.—The City Council is considering the installation of an improved lighting system on Broadway, in the business district, using 400-watt lighting units.

PHILADELPHIA, PA.—The Philadelphia & Reading Railroad has filed plans for the construction of a substation at 1117 Arch Street.

PHILADELPHIA, PA.—Bids will be received by the Electrical Bureau, Department of Public Safety, City Hall, until Nov. 29, for aerial cable, guy wires, hangers, and other supplies. George W. Elliott is director.

CANTON, MD.—Plans for the proposed new local factory of Crosse & Blackwell, Ltd., 146 West Twenty-third Street, New York City, include a power house and machine shop. The cost of the initial unit is estimated at $500,000, with ultimate cost of $1,000,000. Clark, MacMullen & Riley, 101 Park Avenue, New York, are architects and engineers.

BUCKHANNON, W. VA.—The City Council is considering the installation of an ornamental lighting system in the downtown section.

WASHINGTON, D. C.—Bids will be received by the Chief of Engineers, Washington, until Dec. 14, for two 75 kw. motor-generator sets, with accessories; two starting compensators; one switchboard; and three lighting transformer banks (Circular 2.)

WASHINGTON, D. C.—Bids will be received by the United States Engineer Office, 1068 Navy Building, until Dec. 11 for installing and testing two motor-driven pumping units for the District of Columbia water supply project.

North Central States

DETROIT, MICH.—Bids will be received by the Department of Public Works until Dec. 8 for an electric-driven centrifugal or screw-driven pumping unit with auxiliary equipment in connection with the Connors sewage and storm water pumping station.

CLEVELAND, OHIO—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until Dec. 3 for pole type and subway type constant-current regulators for the Division of Light and Power.

HAMILTON, OHIO—The installation of an ornamental lighting system on Main Street, from First Avenue to Manchester, is under consideration by the City Commissioners.

SPRINGFIELD, OHIO—Plans are under consideration by the City Commission for extending the ornamental lighting system (cluster lamps) not only in the business district and sub-business districts, but along the aerial streets, including Yellow Springs, Limestone and East Columbia Streets, Fountain Avenue and other thoroughfares.

TOLEDO, OHIO—Bonds to the amount of $90,000 have been voted for extensions to police and fire-alarms systems.

TOLEDO, OHIO—The East Toledo Civic Association has petitioned the City Council for the installation of an ornamental lighting system on Nevada Street, between East Broadway and Dover Place.

GARY, IND.—The Northern Indiana Public Service Company has petitioned for easements over land in the Calumet district over which a new transmission line is to run between Munster and Hudson Lake, a distance of 60 miles.

ANCHOR, ILL.—The plant of the Anchor Electric Light Company, Inc., has been purchased by the Central Illinois Public Service Company, Springfield, which plans to erect a transmission line from Sibley to Anchor to supply service here.

NILES CENTER, ILL.—The Chicago Rapid Transit Company, Chicago, plans to install electric power equipment in its proposed local car repair shop, to cost about $300,000.

WAUKEGAN, ILL.—Bids will be received by the City Council until Dec. 9 for a new pumping station and filtration plant for the municipal waterworks. The cost of the entire project is estimated at $900,000. Henry A. Allen, 208 North Wells Street, Chicago, is engineer.

BELOIT, WIS.—Preparations are being made by the Wisconsin Power & Light Company, Madison, for new crossing of all its electric distribution lines over the Rock River, consisting of two 70-ft. steel towers and a 750-ft. span to parallel the new Portland Avenue bridge.

GLIDDEN, WIS.—Extensions and improvements are contemplated by the Lake Superior District Power Company, Ashland, which has acquired the property of the Glidden Light, Power & Water Company, including the reconstruction of the power plant and distribution system and the erection of a transmission line from Mellen to Glidden, 20 miles long.

GREEN BAY, WIS.—The Northern Electric Company, operated by the Northern Paper Mills, Green Bay, is constructing a power dam for its proposed hydro-electric plant on the Menominee River at Chalk Hills, near Amberg. The company is also building a hydro-electric plant at White Rapids. The two plants are scheduled for completion in May, 1927. Siems Helmars & Schaffner, St. Paul, are contractors. Holland, Ackerman & Holland, 55 West Jackson Boulevard, Chicago, are consulting engineers.

MADISON, WIS.—Permission has been granted the Wisconsin Power & Light Company to build a hydro-electric plant on the Wolfe River, at Keshena Falls just outside of the Menominee Indian Reservation, where it proposes to develop 900 hp. This is the first of a project providing for the development of six water power sites on the Wolf River to develop 60,000,000 kw. hours annually, at a cost of about $3,000,000.

MILWAUKEE, WIS.—The Upper North Avenue Business Men's Association has petitioned the City Council for the installation of an improved street-lighting system on Upper North Avenue, from Forty-seventh Street west to Wauwatosa Avenue.

MILWAUKEE, WIS.—Plans are underway by the Milwaukee Electric Railway Company and the Public Service Company of Northern Illinois, Chicago, for the erection of a 132,000-volt transmission line between Kenosha, Wis., and Waukegan, Ill., to connect the generating properties of both companies. The portion of the line in Wisconsin will be built by the Milwaukee company and the balance in Illinois by the Public Service company.

MONROE, WIS.—Arrangements are being made by the Wisconsin Power & Light Company, Madison, for the erection of a transmission line east of Juda and also one north of Juda to serve rural districts.

WINNECONNE, WIS.—Plans have been adopted by the Wisconsin Power & Light Company, Madison, for the erection of a 17-mile, 11,400-volt transmission line between Winneconne and Poy Sippi.

COBDEN, MINN.—The City Council is considering the erection of a transmission line to Sleepy Eye, to secure electricity for local light and power service.

GRANITE FALLS, MINN.—Work has started on the erection of a transmission line by the Hawk Creek Light & Power Company, organized by farmers adjoining Granite Falls, which will extend from the municipal electric plant to supply electricity to rural consumers.

HERON LAKE, MINN.—The Peoples Light & Power Company, Lamberton, plans to install an ornamental lighting system on Main Street.

MINNEAPOLIS, MINN.—The Chicago, Milwaukee & St. Paul Railroad Company has contracted with the Northern States Power Company, Minneapolis, to supply power for the local shops of the railroad.

ST. PAUL, MINN.—The City Council has authorized the installation of ornamental lamps on Pinehurst and Hillcrest Avenues and Benn Hill Road. G. M. Shepard is city engineer.

TREAR, IOWA—A contract has been awarded for an addition to the municipal electric plant.

ST. LOUIS, MO.—Bids will be received by the Board of Public Service until Dec. 14 for 3,200 street lamps complete with concrete standards, lanterns, etc., in districts B and C addition to city lighting system. The cost is estimated at $650,000.

ST. LOUIS, MO.—Permission has been granted the Union Electric Light & Power Company to erect an electric transmission and distribution system in Madison County from the Madison Street county line to the plant of the St. Joseph Lead Company. Electricity will be transmitted at 33,000 volts.

BEULAH, N. D.—Plans are under way by the Hughes Electric Company, Bismarck, for the construction of an electric power plant in Beulah, to cost about $200,000.

EDMORE, N. D.—The City Council is considering the erection of a transmission line for municipal electric service.

NAPOLEON, N. D.—The Northern Light & Power Company, Mobridge, S. D., which has acquired the local electric plant, plans to erect a high-tension line from Mobridge to Napoleon.

SALEM, S. D.—The Salem Milling, Lighting & Heating Company is planning to build a new plant and will make connection with the transmission system of the Dakota Public Service Company, Woonsocket.

BEATRICE, NEB.—A special election will be held Dec. 21 to vote on the proposal to issue $251,000 in bonds for the purchase of the local electric plant of the Nebraska Gas & Electric Company, Lincoln.

GRANT, NEB.—General contract for the power station of the municipal electric plant has been awarded to F. M. Parton, Madrid. J. F. Reynolds, 613 U B Building, Sioux City, Iowa, is architect.

HOMER, NEB.—Plans are under way by the Central States Electric Company, Cedar Rapids, Iowa, which recently acquired the municipal electric light plant, to erect a substation in Homer to furnish electricity for local service over a high-tension line from its distributing plant at Walthill, now under construction.

NORTH LOUP, NEB.—A number of taxpayers have petitioned the City Council to take action to contract with the Nebraska Power Company, Omaha, for the disposal of the municipal electric plant and the furnishing of electric service from a high-tension transmission line.

PLAINVIEW, NEB.—An addition to the municipal electric power plant to provide space for a new pump and electric motor is under consideration.

Southern States

FORT BRAGG, N. C.—Bids will be received by the Quartermaster, Fort Bragg, until Dec. 2, for fifty 40-ft. poles, 5,000 ft. rubber-covered wire, etc. (Circular 12.)

CLARKS HILLS, S. C.—The construction of a hydro-electric plant on the Savannah River, near here, to cost about $20,000,000, is under consideration by the Savannah River Electric Power Company, Greenwood.

LAKE VIEW, S. C.—The Carolina Light & Power Company, Aiken, has purchased the local electric plant and plan to erect a transmission line to Lake View to furnish electric service here.

SPARTANSBURG, S. C.—Extensions to the ornamental lighting system is under consideration by the City Council.

LUDOWICI, GA.—Surveys are being made with a view of installing a new municipal electric light plant.

FORT MEADE, FLA.—The City Council has awarded contract for an addition to the municipal electric light and power plant.

ORLANDO, FLA.—The directors of the Florida Public Service Company have appropriated $3,600,000 for extensions of its electric and gas utility properties in 1927.

TALLAHASSEE, FLA.—The West Florida Power Company has applied for permission to construct a hydroelectric power plant on the Ocklocknee River.

TARPON SPRINGS, FLA.—The Pinellas County Power Company, St. Petersburg, which is erecting a substation here, is planning to install an ornamental lighting system around Whitcomb Bayou; also to build a storage and garage building and possibly an auxiliary plant.

DOVER, TENN.—The State Railroad and Public Utilities Commission has granted the Dover Power Company permission to erect transmission lines in Stewart County.

BIRMINGHAM, ALA.—The Alabama Portland Cement Company, Age-Herald Building, Birmingham, plans to install electric power equipment in connection with extensions and improvements to its mill, to cost about $500,000.

AMORY, MISS.—The installation of an ornamental lighting system on Main Street is under consideration. N. W. Lawson is a member of the committee.

GRAVETTE, ARK.—The Benton County Utilities Company plans to build a substation, equipped for 33,000-volt service.

MOUNT IDA, ARK.—The Town Council has granted the Caddo River Lumber Company an electric franchise in Mount Ida. The company plans to erect a high-tension transmission line from Roseboro, via Glenwood to Caddo Gap, Norman to Mount Ida and Mauldin.

AMITE, LA.—Extensive improvement are contemplated by the Central Louisiana Power Company during the next six months, involving an expenditure of about $1,000,000. The work will include 5,000-kw. substation in Amite, and the erection of a 22,000-volt transmission line from the new substation to serve industries and residences in the Hammond-Ponchatoula section, and also extension of the 110,000-volt trasmission line from the Sterlington plant in North Louisiana.

MINDEN, LA.—The installation of an ornamental lighting system on the boulevard is under consideration.

CUSHING, OKLA.—The Empire Refineries, Inc., Tulsa, plan to install electric power equipment, in connection with the rebuilding of its local oil refining plant, recently damaged by fire, with loss of about $300,000.

NEW BRAUNSFELS, TEX.—Work will soon start on the first of the three dams which the Texas Power Corporation proposes to build on the Guadalupe River. The holdings of the Guadalupe Water Power Company have been taken over by the Texas corporation which plans a hydro-electric development on the Guadalupe River calling for an expenditure of $2,500,000. The first dam will be located between McQueeny and New Braunfels; the second at McQueeny, 4 miles west of Sequin, and the third just below Sequin.

PALESTINE, TEX.—The City Council is considering replacing the gas lamps now in use with electric lamps.

SAN ANGELO, TEX.—The San Angelo Water, Light & Power Company, which is planning to build a large steam-driven electric plant at Lake Concho, has engaged Sargent & Lundy, 72 West Adams Street, Chicago, consulting engineers, to prepare plans for the proposed plant.

SAN ANTONIO, TEX.—The San Antonio Public Service Company has acquired a site near the track of the International Great Northern Railroad and McCullough Avenue, on which it proposes to build a substation.

Pacific and Mountain States

LOWELL, WASH.—The Walton Lumber Company plans to install electric power equipment in connection with the rebuilding of its mill recently destroyed by fire, to cost about $250,000.

YAKIMA, WASH.—The Yakima Fruit Growers Association plans to install electric power equipment in its proposed cold storage and refrigerating plants in the Yakima Valley district, and at Zillah, to cost about $225,000, and $100,000 respectively.

ALHAMBRA, CAL.—The City Commissioners are considering the installation of ornamental lamps on portions of Fremont Avenue, Front Street and the Valley Boulevard.

HUNTINGTON BEACH, CAL.—Work will begin at once by the Southern California Edison Company, Los Angeles, on the construction of a new substation, 4 miles north of the city, to cost about $135,000. The equipment will include four 2,000-kva. transformers, etc.

LOS ANGELES, CAL.—The installation of ornamental lamps on Lincoln Boulevard, Rialto and Euclid Avenues, to cost about $25,000 is under consideration.

MODESTO, CAL.—Plans are being considered by the directors of the Modesto Irrigation District to build a stepdown station in connection with the Hetch-Hetchy power contract with the city and San Francisco County. R. J. O'Connell is electrical engineer for the district.

MOUNTAINVIEW, CAL.—The City Council is considering the installation of ornamental lamps in the Nelson Manor section.

OAKLAND, CAL.—Bids will be received by the City Council until Dec. 9, for the installation of ornamental lamps on portions of Broadway, Washington, Harrison, Eleventh and other streets, totaling 353 duplex standards, with underground conduit system, to cost about $200,000. Carl E. Hardy is city electrical engineer.

PASADENA, CAL.—The City Council has approved plans for the installation of ornamental lamps on portions of Del Rey, Bella Vista and Vinedo Avenues, and Huntington Drive.

SAN FRANCISCO, CAL.—The Lighting Committee of the Board of County Supervisors has submitted recommendations for the installation of an ornamental lighting system, covering thirty blocks near the city limits, including Mission Street, from the Embarcadero to the county line. William P. Stanton is chairman.

WHEATLAND, CAL.—The Pacific Gas & Electric Company, San Francisco, has authorized the installation of additional equipment at its local substation, to cost about $12,200.

AMERICAN FALLS, IDAHO—Plans are under consideration by the Idaho Power Company, Boise, for extensions and improvements in its local hydro-electric plant, to include the installation of two 6,000-kw. generating units, etc., to cost about $1,000,000. Extensions will be made in transmission system.

IDAHO FALLS, IDAHO—H. F. Samuels, care of Cotton & Wilson, Idaho Falls, consulting engineers, is at the head of a project to construct a hydro-electric plant on the Teton River, in the Teton Basin district, to cost about $300,000.

SUPERIOR, ARIZ.—The substation at the Magna Copper mine was recently damaged by fire, causing a loss of about $100,000.

ANACONDA, MONT.—A contract has been awarded to the Western Electric Company, 802 Farnam Street, Omaha, Neb., for the installation of an ornamental lighting system, to cost $10,000.

MISSOULA, MONT.—Plans for the proposed local beet sugar refinery of the Amalgamated Sugar Corporation, Ogden, Utah, to cost about $1,000,000, include a power plant.

DENVER, COL.—The City Council is considering a petition for the installation of an ornamental lighting system on Arapahoe Street, from Broadway to Seventeenth Street.

ALAMOGORDO, N. M.—The Texas-Louisiana Power Company, Fort Worth, Tex., which has acquired the municipal electric plant, and has also contracted to supply electricity in La Luz and Tularosa, is planning to extend its lines to the Fall ranch at Three Rivers, with a view to an extension later into Lincoln County. The company also contemplates building a line which will develop Mountain Park, Highrolls and Cloudcroft, and will also serve the Warnock mines south of Highrolls.

Canada

WINNIPEG, MAN.—Tentative plans are under consideration by the Manitoba Power Company for the erection of a transmission line into the Central Manitoba Mines properties, a distance of about 41 miles from Great Falls.

BRIDGEBURG, ONT.—The Canadian-Niagara Power Company plans to install an underground conduit system on Jarvis Street, to replace the present overhead lines. The City Council is considering the installation of an ornamental lighting system, using metal standards.

LONDON, ONT.—At an election to be held Dec. 6 the proposal to appropriate $150,000 for the Springbank project will be submitted to the ratepayers.

Electrical Patents

Announced by U. S. Patent Office

(Issued Oct. 19, 1926)*

1,603,833. ALTERNATING-CURRENT POLYPHASE TRANSFORMER; A. Boyajian, Pittsfield, Mass. App. filed May 28, 1923. Arrangement and interconnection of transformer windings for converting polyphase current from a two-phase source into six-phase current suitable for various purposes such as the operation of synchronous converters and alternating-current rectifiers. A polyphase transformer system comprising a group of three windings in phase with each other and a group of two windings in phase with each other and displaced 90 deg. in phase from said group of three windings, said two windings being connected between the terminals of two of said group of three windings and having their centers connected to intermediate points of the third of said group of three windings.

1,603,849. POWER SYSTEM; B. S. Hornby, Bolton, England. App. filed Feb. 1, 1924. Means for transmitting polyphase alternating current through underground or submerged cables at high voltage without excessive losses in the cables. A polyphase power system comprising a plurality of separate cables each arranged to conduct current of one phase only and each provided with an outer and inner conductor, means interconnecting the outer conductors of said cables at one end, and a polyphase transformer associated with the opposite end of said cables to cause the current in each inner conductor to be opposed to the current in the outer conductor by which it is surrounded, whereby the inductive losses of said cables are reduced.

1,603,875. POWER SYSTEM; G. B. Shanklin, Schenectady, N. Y. App. filed Oct. 24, 1924. Wherein separate single-conductor cables are utilized for the transmission of alternating current. An arrangement whereby the inductive losses of such cables may be rendered substantially independent of the spacing between the cables.

1,603,884. LIGHTING FIXTURE; O. H. Van Amberg, Schenectady, N. Y. App. filed Jan. 28, 1921. Of the type wherein the wall or ceiling portion of the fixture comprises a wired unit and the bracket or hanging portion of the fixture comprises a second wired unit, the latter being adapted to be detachably connected mechanically and electrically to the former, the electrical connection being made by means of a receptacle and plug connection.

1,603,940. ELECTRICAL APPLIANCE; J. R. Eaglen, Hazlewood, Pa. App. filed Aug. 25, 1924. A plug adapted to be tapped into a wall socket, the plug itself provided with a plurality of sockets, one to receive a line wire plug, one for a light bulb and the remaining one being especially designed for reception of an auxiliary low-current capacity fuse.

1,604,069. HOLDER FOR ARC-WELDING ELECTRODES; F. C. Owen, Fayetteville, N. C. App. filed Jan. 27, 1925.

(Issued Oct. 26, 1926)

1,604,357. ELECTRIC SWITCH; W. F. Koken, Webster Groves, Mo. App, filed July 26, 1924. Toggle type.

1,604,408. HOT-WATER-DISPENSING DEVICE; O. Graetzer, Zurich-Zollikon, Switzerland. App. filed May 19, 1925. A water heater which will allow tapping hot or cold water as desired without requiring any switching on or off of the electric current.

1,604,415. ELECTRIC POWER SYSTEM; J. J. Kane, Milwaukee, Wis. App. filed Jan. 17, 1920. Apparatus for regulating generators connected to supply variable loads, especially where there is a tendency for the generator-driving means to operate at a speed dependent upon the load. Applicable to such generators as are used to supply lamps on a railroad train or locomotive.

1,604,431. ALTERNATING-CURRENT MOTOR; H. Weichsel, St. Louis, Mo. App. filed May 15, 1924. Of the self-excited synchronous type, having a stator winding construction and arrangement which will result in economy in copper, simplification of starting equipment, and at the same time secure satisfactory starting and running performance.

1,604,432. ALTERNATING-CURRENT MOTOR; H. Weichsel, St. Louis, Mo. App. filed June 20, 1925. Self-excited synchronous induction motor which may be provided with commutating holes for the purpose of improving commutation and which will nevertheless be capable of operation in both directions of rotation without the necessity of providing more than one set of commutating holes per pole pair. Means for adjusting the angular relation of the brush axis and the resultant direct-current magnetization of the machine without moving the brushes.

1,604,438. ELECTRIC TRANSMISSION FOR VEHICLES; H. K. Whitehorne and N. E. Kearley, Maidstone, Eng. App. filed Feb. 3, 1925. Of the kind in which a generator is driven by a prime mover and supplies current to drive a motor or motors. It is more particularly applicable to vehicles of the type generally known as "gas-electric" wherein an internal-combustion engine drives a dynamo which supplies power to a motor or motors driving a Cardan shaft or the wheels of a vehicle direct.

1,604,453. ELECTRIC SWITCH-OPERATING DEVICE; G. H. Kuester, Melvin, Iowa. App. filed June 7, 1924. Chain-operated snap switch of the rotary type.

1,604,477. ELECTRIC FUSE; E. L. Ogle, Chicago, Ill. App. filed Oct. 27, 1921. Designed for heavy loads, whereby they are made more ready of assembly and more easily flexible in the matter of adjustment of the cartridge to the designed load.

1,604,492. FLOAT-CONTROLLED VALVE AND SWITCH; I. E. Smith, Stockton, Cal. App. filed Sept. 21, 1925. For use in connection with oil supply systems of electrically driven oil burners.

1,604,495. CIRCUIT-MAKING-AND-BREAKING DEVICE; A. G. Steinmayer, Milwaukee, Wis. App. filed Jan. 10, 1925. A mercury contactor.

1,604,499. ELECTRIC-LIGHTING FIXTURE; W. Symmes, San Francisco, Cal. App. filed Jan. 31, 1925. Holder for supporting a globe or bowl from the ceiling.

1,604,516. HOUSE-WIRING CASING; J. Jacobsen, Waterbury, Conn. App. filed July 22, 1922. For electrical house wiring; adapted for use as a wall-box unit which can be enlarged by connecting a number of the individual boxes or units together.

1,604,519. CONTROL SYSTEM; L. D. Kellogg, Deerfield, Ill. App. filed Nov. 9, 1921. For a combined pressure supply and storage-battery-charging system for automatically maintaining a pressure within certain predetermined limits; for a combined farm-power plant and water-pressure system.

1,604,534. ELECTRIC FURNACE; L. Satchwell, Slough, Eng. App. filed Aug. 8, 1925. Resistance type. Constructed to accommodate a cylindrical drum or container adapted to contain the articles or material to be heated and bearing on rotatable shafts which extend outside the furnace, such shafts being connected together for rotation whereby to rotate the drum or container.

1,604,544. SPECIAL CARBON FOR THE STARTING OF A VOLTAIC ARC WITH ULTRA-VIOLET RAYS; L. Arnone, Florence, Italy. App. filed Nov. 14, 1923. Carbon for use in the artificial formation of special ultra-violet rays for heliotherapic purposes.

1,604,558. PORTABLE ELECTRIC RADIATOR; A. Johnson, Oakland, Cal. App. filed June 1, 1926. Wherein reflection and air circulation are employed.

1,604,584. IONIC-CONCENTRATION METER; E. A. Keeler, Norristown, Pa. App. filed May 7, 1920. Apparatus for measuring the ionic concentration of a solution by measuring the difference of potential between suitable electrodes in contact with the solution.

1,604,586. HIGH-TENSION-SWITCH MECHANISM; B. W. Kerr, Greensburg, Pa. App. filed Jan. 14, 1926. Outdoor type. The combination of switch blade pivotally mounted at one end and carrying a contact movable with respect to the blade at the other end, a second contact for co-operation therewith, a housing movably mounted on the switch blade, and means operative in all angular positions of the switch arm for maintaining the housing in position to protect the movable contact, said means including a link parallel to the blade in all positions thereof.

1,604,611. ELECTRICAL MEASURING INSTRUMENT; R. Simpson, Oak Park, Ill. App. filed Nov. 21, 1923. Of the permanent magnet and moving coil type.

1,604,612. TERMINAL CASE; A. L. Starke, Brookhaven, N. Y. App. filed Aug. 15, 1925. Having therein a series of conductor terminals, each being insulated from the other and so arranged that the various leads which are connected to the terminals will also be insulated from each other and may be properly designated to indicate the leads.

1,604,618. ELECTROPLATING APPARATUS; J. G. Swain, Akron, Ohio. App. filed Nov. 12, 1923. Automatic conveying and plating apparatus by means of which the small articles are carried through successive baths or tanks.

1,604,628. BARLOCK FOR ELEVATOR DOORS; C. W. Bassett, Maplewood, N. J. App. filed Aug. 8, 1923. A combination lock and switch by means of which an elevator door may be locked in position and by which the elevator-operating circuit may be opened and closed with the opening and closing movements of an elevator door.

1,604,669. TIME-LIMIT RELAY; H. L. Van Valkenburg, Milwaukee, Wis. App. filed May 16, 1925. With a quick-make and quick-break device in which the movable contact when in closed position will be positively locked in that position and in which the locking element for the movable contact moves toward closed position. A self-closing, self-locking switch with manually operated means for suspending the normal closing and locking action, so that without changing the construction of the parts but by merely adding something to the mechanism the switch may be made to suspend its usual closing and locking action until permitted to do so by the operator.

1,604,693. MEANS FOR SIGNALING UNDER WATER; H. Hecht and L. Adelmann, of Kiel; A. du Bois-Raymond, Plon, and W. Hahnemann, Kitzeberg, Germany. App. filed Jan. 6, 1921.

1,604,768. CAP FOR LAMP SOCKETS AND THE LIKE; A. H. Fleet, Milwaukee, Wis. App. filed Sept. 13, 1920.

1,604,798. JACK RECEPTACLE-TESTING DEVICE; G. W. Atkinson, Springfield, Mass. App. filed March 10, 1925. Where permanent means is to be provided in an electrical circuit for making a quick, easy and safe method of ascertaining the load condition on an energy-consuming apparatus.

1,604,818. ATTACHMENT-PLUG RECEPTACLE; A. C. Gaynor, Stratford, Conn. App. filed March 22, 1922. Adapted to receive attachment plugs having jacks or blades in different relative positions.

1,604,819. PRESS BUTTON; A. C. Gaynor, Stratford, Conn. App. filed Dec. 22, 1922. As used for bell circuits.

1,604,859. SWITCH HANDLE; G. B. Thomas, Bridgeport, Conn. App. filed April 8, 1922. For rotary snap switches.

1,604,872. MULTICELL BATTERY; F. T. Baird, Blue Island, Ill. App. filed Oct. 10, 1923. Whereby one series of cells may be switched into circuit and utilized for a certain period, then another series switched into circuit and used until that series of cells becomes weaker, and thereafter the entire set of cells may be thrown into circuit and employed until all of the cells have been worn out.

1,604,898, 1,604,899. ASYNCHRONOUS MOTOR; V. A. Fynn, St. Louis, Mo. Apps. filed July 5 and Oct. 8, 1924. The improvement or control of the power factor or the compensation of such motors.

1,604,900. NON-SYNCHRONOUS PHASE-COMPENSATED MOTOR; V. A. Fynn, St. Louis, Mo. App. filed Dec. 17, 1924. Means for controlling the power factor or the phase compensation of such machines and a system of distribution embodying such compensated machines.

1,604,901. ASYNCHRONOUS INDUCTION MOTOR; V. A. Fynn, St. Louis, Mo. App. filed April 23, 1925. The control and improvement of the power factor of such machines.

1,604,902. ASYNCHRONOUS MOTOR; V. A. Fynn, St. Louis, Mo. App, filed Dec. 16, 1925. The improvement or control of the power factor or the phase compensation of polyphase motors of this type.

1,604,907. ELECTRIC LAMP; G. W. Goodbridge, Fairfield, Conn. App. filed July 22, 1924. A lamp base with self-contained means which, upon the removal of the lamp from a standard socket, operates to disable the lamp and render it unfit for further service.

1,604,939. ARC LAMP; C. A. Green and H. J. Brunk, Chicago, Ill. App. filed April 11, 1924. Such as used in the blueprinting, photo engraving and other arts; a globe holder for such lamps.

*Some of the patents issued Oct. 26 appeared in the issue of Nov. 13 prior to those issued Oct. 19. The patents issued Oct. 19 started in the issue of Nov. 20 and are completed in this issue. The patents issued Oct. 26 which did not appear in the issue of Nov. 13 owing to lack of space are continued in this issue.